211050

JPRS-ELS-87-033
8 JUNE 1987

FOREIGN
BROADCAST
INFORMATION
SERVICE

JPRS Report

Science & Technology

Europe & Latin America

JPRS-ELS-87-033
18 JUNE 1987

SCIENCE & TECHNOLOGY
EUROPE & LATIN AMERICA

CONTENTS

WEST EUROPE

SCIENCE & TECHNOLOGY POLICY

Finland: S & T Parks, Technology Nets Promote High Technology (HELSINGIN SANOMAT, various dates) 1

Province Wants Technology Net 1
Crisis Time Database to Jyvaskyla 3
Otaniemi: Electronics, Optics, Biotech 4
Kuopio: Nutrition, Medicine, Environment 5
Turku: Computers, Instruments, Biotech 5

EAST EUROPE

CHEMICAL ENGINEERING

Development of Polish Chemical Industry Up to 1990 (Jerzy Paprocki; PRZEMYSL CHEMICZNY, No 9, Sep 86) 7

Yugoslav Achievements in Superconductivity (VJESNIK, various dates) 18

Initial Achievements Noted, by Marika Toth 18
Superconductivity at 91 degrees Kelvin 22

COMPUTERS

Hungary: CAD/CAM Applications Lag Behind Research (Zoltan Tompe; HETI VILAGGAZDASAG, No 3, 17 Jan 87) 24

Hungary: CAD System for Design of Printed Circuit Boards
(Sandor Radai, Gyorgy Mihalyi; HIRADASTECHNIKA, No 3, 1987) 28

Romania: Computers in Automation, Robotization
(Adrian Davidoviciu; REVISTA ECONOMICA, No 52, 26 Dec 87) 41

FACTORY AUTOMATION, ROBOTICS

Triumphs, Vicissitudes of Hungarian Machine Industry Automation
(Jozsef Hatvany, Matyas Horvath; GEP, No 3, Mar 87) 45

LASERS, SENSORS, OPTICS

Poland: Precision Manipulators for Lasers
(Z. Mrugalski, et al.; FINOMMECHANIKA-MIKROTECHNIKA, No 12, Dec 86) 50

MICROELECTRONICS

Hungary: Table of Contents of Electronics Journal
(MAGYAR ELEKTRONIKA, No 2, 1987) 55

Hungary: Modeling on the Basis of Prolog
(Ivan Futo; MAGYAR ELEKTRONIKA, No 2, 1987) 57

Hungary: Prolog Processor for PC's
(Peter Garami; MAGYAR ELEKTRONIKA, No 2, 1987) 63

Hungary: Development of Hardware at Computer Research Institute
(Jozsef Drasny; MAGYAR ELEKTRONIKA, No 2, 1987) 69

Hungary: Digital Image Processing System From SZKI
(Jozsef Szabo; MAGYAR ELEKTRONIKA, No 2, 1987) 77

SCIENCE & TECHNOLOGY POLICY

Poland's 1986-1990 S&T Aims
(PRZEGLAD TECHNICZNY, No 50, 14 Dec 86) 83

Poznan Fair Exhibits Described, Evaluated
(RADIOELEKTRONIK, No 11, Nov 86) 92

Complaints of Polish Marine Engineers Noted
(Zbigniew Grzywaczewski, Andrzej Golebiowski; BUDOWNICTWO OKRETOWE, No 12, Dec 86) 98

LATIN AMERICA

COMPUTERS

Brazilian Protectionists in Computer Industry To Organize
(Mari-Angela Heredia; DATA NEWS, 9 Feb 87) 115

Brazilian Retailers of Foreign Software Criticized
(Rosane Serro; DATA NEWS, 23 Mar 87) 117

/9986

FINLAND: S & T PARKS, TECHNOLOGY NETS PROMOTE HIGH TECHNOLOGY

Province Wants Technology Net

Helsinki HELSINGIN SANOMAT in Finnish 25 Mar 87 p 12

[Article: "Keski-Suomi Wants to Become Finland's First Data-linked Province"]

[Text] Jyvaskyla (HS) The country's first technology net which would unite an entire province is being planned in Keski-Suomi. It would bring international and domestic databases, state and municipal offices, industrial parks, enterprises and many research units within telephone's reach of one another.

A cost estimate for the venture has been calculated at 2.6 million markkas. The planning phase should cost 190,000 markkas. Enterprises chosen for the experiment and a development fund, which has not yet taken a stand, are to be the financiers of the venture. The idea of the technology net crept into the province's development program already 2 years ago, when it was also mentioned for the first time that Keski-Suomi should be designated a data-link province.

Ideas and operating models have been considered in the industrial commission of the province. With a 50,000 markka grant from Kera, the commission had a preliminary study done at the State Technical Research Center's (VTT) Domestic Fuel Laboratory (KPA). The compiler of the report, researcher Jarmo Hallikas, says that the technology net will increase interaction between people. Videotext system has been chosen as the data communication mode for small enterprises. According to Hallikas it will have nearly a 100,000 Finnish users by the end of the century.

If the funding is found 15 enterprisers will be accepted into the experiment, for whom training will be arranged, equipment provided and data links to the registers.

Hallikas reminds us that Jyvaskyla is one of the centers of the governmental information net and this will speed up the acquisition of information.

Jyvaskyla's Own Part of the Government

The nuclei of Keski-Suomi's technology net are Jyvaskyla's Data Center and the Technology House. The first concentrates the adp ventures, the latter funding and enterprise organizations.

University of Jyvaskyla and the technical and other trade institutions assure the users of the net access to training materials, research results and international contacts.

VTT and the State Automation Center (VTKK) are, according to previous agreements, reinforcing their stations in Jyvaskyla, which will in few years have operating a new VTT data processing unit, KPA laboratory, and a VTKK institution consisting of over 200 workers.

From the world of enterprise, the Valmet Paperikoneet company and the state owned Vapo company, which have strong research and development departments, have been suggested as users of the technology net.

Municipal trade representatives, industrial parks, enterprises and companies and district planners would be included in the experiment and for its construction the Keski-Suomi district post and telecommunications institution.

Connections would be made along ordinary telephone channels. All that are needed are such digital centers which about half of the 32 municipalities in the province already have.

"It is possible to build a fast data transmission net within the Jyvaskyla city area, with the help of which it will be possible to get the large and medium sized computers to talk to one another. Such networks are being built at Helsinki, Espoo, Oulu and Tampere."

Hallikas suggested that Jyvaskyla would specialize in the processing of governmental information but also partly in technical. In electronic data processing Oulu is clearly the best.

Keski-Suomi has the best experts in programs or soft-ware; on the other hand the manufacturing of devices or hard-ware is only in its early stages. A specialist could find a niche in the markets in the production of devices needed for data transmission.

Praise for Keski-Suomi from the South

Planner Veijo Kavonius, from the district policies division of the interior ministry, praises the initiative of Keski-Suomi, but also reminds us that the transformation of the "data-link province" into a genuine data-link province is only at its beginnings.

Research and development activity has been concentrated in south Finland and especially in the capital area. This is where one would most certainly find the newest, most developed and specialized adp ventures.

Kavonen reminds us that "Because the markets for new products are primarily in south Finland, technological development likewise generally advances from the south to north."

Crisis Time Database to Jyvaskyla

Helsinki HELSINGIN SANOMAT in Finnish 11 Mar 87 p 11

[Article: "Jyvaskyla's Data Center Entices State Institutions"]

[Text] Jyvaskyla (HS) State institutions are stressing the placement of their data technology ventures in Jyvaskyla; the Data Center venture, for example, is gradually moving from a planning phase to a practical realization.

The foundation of the first building will be laid this week in the Mattilanniemi suburb. The technology park containing 54,000 square feet of multiple level space will be completed during the 1990 phase. The state computer center (VTKK), which is allocating 2/3rds of its entire growth for Keski-Suomi, has especially increased its activities. VTKK employs 110 workers in Jyvaskyla and has built its crisis database into the city rock shelters. Annually the number of employees will grow by 15-20 individuals, until it reaches 250 by 1990.

VTKK will build a 6,000 square meter facility costing 30 million markkkas at the Data Center. According to the director, Juhani Ryhanen,the services provided by the institution will grow in the public sector outside the government, especially in the health field.

The State Research Center, VTT, is also increasing its services in Jyvaskyla, where it will build part of its data processing laboratories. A decision is expected in the next state budget; this year's version already expressed a favorable stand. In addition VTT is expanding its domestic fuel research laboratory in the city.

The Data Center's project chief, Jussi Nikari, mentioned that the venture is based on very extensive cooperation with the University of Jyvaskyla, different research institutions, enterprises, funders and the Technology Development Center (Tekes).

Data Center has also received development aid from the state, and is now counted as one of the heavyweights among the technology parks such as Otaniemi, Oulu, Tampere, Turku, Lappeenranta and Kuopio.

The largest of the future participants in the Data Center will be Valmet whose subsidiary, the Procons company, has already undersigned an agreement concerning its own research objective.

Preliminary agreements or reservations have been signed already with 15 enterprises. The Data Center can accomodate about 60 companies, of which majority will be small, specialized data processing ventures.

The project is being pushed by the city-owned Jyvaskyla Industrial Real Estate Company which is at present seeking funding and shareholders for the technology center company, Teknologiakeskus Tietotaajama Oy. Its capital shares are planned to be about 5 million markkas.

Otaniemi: Electronics, Optics, Biotech

Helsinki HELSINGIN SANOMAT in Finnish 12 Mar 87 p 29

[Article: "Technology Park Inaugurated in Otaniemi"]

[Text] Seppo Linblom, Minister of Trade and Industry, inaugurated the Otaniemi technology park on Wednesday. The park has 5 buildings, 4,000 square meters of floor space, and has 44 enterprises employing 120 individuals functioning there at present.

The enterprises are primarily appliers of data processing or electronic technology, but also included are mechatronic, biotechnological, packing industry, anturi-technological and optical enterprises.

The chairman of the technology park government, Ilpo Santala, said during the inauguration that one of the most important tasks now is the creation of an infrastructure within the technological community. Consultation ventures which aid, e.g. in in product development, calculations, marketing, exports and funding, are needed for the beginning technology student and faculty enterprises.

Santal also sketched the ambitious goals the State had set for the technology park. According to them the park would have functioning in it by 1990 100 enterprises and a 1000 individuals. 150 million markkas would have been invested in construction and 300 million in operations. The total business turnover would be 400 million and the turnover for the 3 enterprises created by the venture would reach from 20 to 100 million.

By the turn of the millenium the park will have reached the proportions of a technopolis according to Santala, and the enterprises under its aegis could have a turnover of 20 billion markkas; its employment influences would affect the entire nation.

According to the Minister our country does not have conditions for the founding of many technological parks in the proper sense of the word, but that does not mean that individual municipalities and regions could not strive to create some kinds of applied technology centers for the furthering of change in technological structure.

Kuopio: Nutrition, Medicine, Environment

Helsinki HELSINGIN SANOMAT in Finnish 12 Mar 87 p 29

[Article: "Technological Center Opens in Kuopio"]

[Text] Kuopio (HS) Finland's sixth technological center will begin its operations in Kuopio this spring. High technology enterprises are sought in different areas in which the University of Kuopio has a strong fund of knowledge.

The director of the Orion Pharmaceutical company, Jorma Pylkkanen 45, has been invited to become the acting director of the Kuopio Technology Center company, Kuopion Teknologiakeskus OY. He will start his new job at the beginning of May.

The technology center, owned by the city of Kuopio, has began to lease business spaces to enterprises from the real estate it controls at Kotkankallio. In time, as needed, new facilities will be constructed at the technology park next to the University at Savilahti.

University of Kuopio offers the technology center several new areas from which, according to rector Juhani Karja, manysided entrepreneurial activity could ensue. Kuopio lacks the connections to higher technical education, but for example, nutrition, biotechnology, environmental hygiene, plus the developing physics and electronics are suitable bases for research.

Turku: Computers, Instruments, Biotech

Helsinki HELSINGIN SANOMAT in Finnish 11 Mar 87 p 11

[Article: "Technology Center Expands in Turku"]

[Text] Turku (HS) Neither frosts nor strikes have been able to disrupt the schedule of Data City, a technology center rising on Lemminkainen street in Turku. At the conclusion of the third phase of construction this month the centerwillbethelargestintheNordiccountries.

But in Turku even this is not enough. The fourth phase, Bio-City, will be started according to plan in 1989-90. An imposing 10-12 story building is being planned for the corner of Itainen Pitkakatu and Lemminkaisenkatu.

The surface area of the first 2 phases is about 2 1/2 hectares, of which 75-80% has been sold or rented. "The venture was needed," opined Antti-Juhani Lehti, the acting director of Perusyhtyma OY and J Lunden OY, the builder of the facility.

Moving into the Data-City, among others, will be the data processing center of the city of Turku, the data processing and instrument tecnology departments of 3 Turku high schools plus industrial enterprises in the area.

The third building phase containing 15,000 square meters gross area will be targeted for small futuristic enterprises. "The first 3 building phases have concentrated on data processing and electronics. The fourth phase will be used for biotechnology."

The frame of the building's first phase of construction is already completed and the brick siding is in the process of being prepared; also a third of the frame of the third phase has been commpleted. The third phase is going to be partly attached to the others. Cost estimates for the buildings run to about 175 million markkas. The building can be partly put to use already next November.

The first 3 building phases of Data City provide work sites for about 1000 individuals. The building will house about 300-400 students.

The Center is located within a short walking distance from the Turku high schools. "The basic idea is of a society in which each party cooperates for the production of as good an end product as possible," explains architect, Benito Casagrande, the representative for the plans designer.

12989
CSO: 3698/379

DEVELOPMENT OF POLISH CHEMICAL INDUSTRY UP TO 1990

Warsaw PRZEMYSL CHEMICZNY in Polish No 9, Sep 86 pp 453-457

[Article by Jerzy Paprocki, Ministry of Chemical and Light Industries: "Directions of the Restructuring and Development of the Chemical Industry in Poland up to 1990"; the first paragraph is a summary]

[Text] The current state of the chemical industry in Poland is described, outlining the directions of its modernization, restructuring and development that have been adopted for the period up to 1990.

In evaluating the situation in the Polish chemical industry, various aspects must be covered. A comparison of most of the current products in basic branches of this industry with the results of 1980 shows that the situation is uneven. In some groups of products the output level of the crisis years has been surmounted in 1985; this concerns, among other things, soda ash, phosphate fertilizer, basic plastics, synthetic rubber and detergents. Regrettably, in many branches most of the products in 1985 were still at a lower level of output than five years ago. This refers, above all, to refining of crude oil, output of sulfur and the quantity of petroleum products produced (gasoline and oils), caustic soda, nitrogen fertilizer, chemical fiber and varnish products.

According to the Central Annual Plan for 1986, major improvements of the situation were planned in some of the branches; this concerns the output of caustic soda, nitrogen fertilizer, polyvinyl chloride and synthetic rubber. As a result, in all these groups of products and in many others the industry will exceed in 1986 the highest level of output achieved before 1980. The relevant specific data are given in Table 1.

In comparing the situation in the Polish chemical industry in 1980 and 1985, one should bear in mind that in the meantime the world chemical industry has advanced and Poland's share in overall (world) output has, unfortunately, diminished. This concerns, in particular, the output of elemental sulfur (a drop in output share from 27.9 percent to 19.3 percent), the amount of nitrogen fertilizer (from 2.1 to 1.6 percent), sulfuric acid, synthetic fiber and other synthetic products. Another indicator characterizing the situation of the Polish chemical industry against the background of the world market is the per capita output of basic chemical products. The pertinent data are in Table 2 (the data for 1983 and 1984).

Table 1. Output of Most Important Chemical Products in Poland in 1980, 1985 and 1986 (plan)

Item	Production output			Indicators [%]		
	1980	1985	1986 (plan)	1985/1980	1986/1985	1986/1980
Gasoline fuels [million metric tons]	2.7	2.3	2.2	85.2	95.7	81.5
Engine fuel [Mmt]	5.1	4.8	4.9	94.1	102.1	96.1
Sulfur [Mmt]	5.2	4.9	5.0	94.2	102.0	96.2
Soda ash [thousand metric tons]	761.8	987.1	1025.0	129.6	103.8	134.5
Caustic soda [Tmt]	415.5	384.2	590.0	92.5	153.6	142.0
Nitrogen fertilizer (recalculated to N) [Tmt]	1249.3	1222.7	1495.0	97.9	122.3	119.7
Phosphate fertilizer (recalculated to P_2O_5) [Tmt]	841.9	888.7	920.0	105.6	103.5	109.3
Polyethylene [Tmt]	110.8	141.8	139.0	128.0	98.0	125.5
Polypropylene and copolymers [Tmt]	58.7	64.7	62.0	110.2	95.8	105.6
Polyvinyl chloride & copolymers [Tmt]	125.2	126.3	267.3	100.9	211.6	213.5
Synthetic rubber [Tmt]	102.5	108.3	112.8	105.7	104.2	110.0
Chemical fiber [Tmt]	256.4	240.7	245.0	93.9	101.8	95.6
Varnish products [millions of dm^3]	328.1	325.9	321.0	99.3	98.5	97.8
Detergents [Tmt]	185.5	218.3	213.0	117.7	97.6	114.8

Table 2. Chemical Products, Per Capita Output in Poland & Other Countries

Product	Output (kg per inhabitant)						
	Poland	Bulgaria	Czechoslovakia	GDR	USSR	FRG	France
Sulfuric acid	75	101	81	53	92	73	82
Nitrogen fertilizer	36	52	37	57	43	17	28
Phosphate fertilizer	24	27	25	17	26	9	22
Plastics	15	44	65	62	16	118	56
Synthetic rubber	3	3	4	10	-	7	9

This situation to some extent is a result of the world politicoeconomic conditions in which the Polish economy found itself a few years ago, and which partly can be considered objective factors. It is a disconcerting factor, however, that for more than 10 years the capital invested in the expansion of the chemical industry has been decreasing in Poland as a share of the total spending on national industrial development. Back in 1965-70 this indicator was 19.2 percent, while between 1971 and 1975 it declined to 15.2 percent, between 1976 and 1980 to 11.3 percent and in the 1980's dropped to 9 percent.

There is no need at this point to prove the importance of the chemical industry to the economy of each nation or that the growth rate of the chemical industry should be faster than in other industries. Unfortunately, this is not the case in Poland, which is confirmed (to the country's detriment) by the increase in the negative balance of chemical exports and imports.

In estimating the current situation of the chemical industry in Poland and the developments in this industry over the past few years, one should also note the positive elements, which include the following:

--a substantial improvement of labor productivity;

--the introduction of import-replacing manufacturing of certain products;

--resumption of investment goals which have been halted in the past period or completely abandoned; and

--efficient deployment of certain investments, despite the restrictions often imposed by Western firms (e.g., Police II, oxyalchohols at nitrogen plants Kedzierzyn, pharmaceutical plasters at the chemical fiber enterprise Chemitex in Wroclaw and others).

Restructuring of the Chemical Industry

The resolution of the 14th Plenum of the Central Committee of the PZPR, in discussing the new political, social and economic conditions, notes the importance of restructuring the national economy and especially industry. This recommendation was especially relevant to the chemical and fuel industries. Starting from the mid-1970's and into the 1980's, the conditions under which these industries operated and developed changed. It became necessary to adapt to the new situation, something commonly referred to as restructuring. Among the most important factors which led to this situation and predetermined future activity, one can mention the following:

--the rapid technological aging of the basic stock and the need for intensified reinvestment;

--changes in the system of startup costs and financing in most areas of capital investment; the allocation system was abandoned and the initiative in this area was given to enterprises which, in conjunction with the general difficulties of the economy in Poland, resulted, among other things, in limited capital investment;

--substantial reduction of the workforce;

--drastic curtailment of hard currency funds for investment and purchase of raw materials; semifinished products and components necessary for current production;

--increased importance of domestic scientific research and development facilities and Polish innovations; and

--the need for radical improvements in environmental protection measures.

Much attention has been given to restructuring in chemical and light industries. The ministry had held two sessions of its top officials and several ministerial and industry-wide conferences with participation of the minister of chemical and light industries and undersecretary of state for this ministry. On a large scale, fundamental work was conducted at the level of enterprises, specialized design bureaus and institutes and industrial associations. All these efforts were organized and coordinated by the development department of the ministry. The importance and the scope of work in restructuring the chemical and fuel industry was characterized in the remarks of the minister, Professor E. Grzywa, DSc (eng), who, speaking at the session of the leading officials of the ministry on appraisal of the current situation, compared the present work with the efforts undertaken several years ago in the ministry to develop the program of chemicalization of the national economy. Minister E. Grzywa expressed his appreciation to all those working in chemical and light industries and thanked them for their contribution.

Before describing the results of the work in restructuring of the chemical industry and fuel production, it should be noted that separating restructuring from modernization, expansion and building of industry is sometimes difficult and even impossible. For this reason, the basic elements of the restructuring effort will be described together with the plans concerning the development of the individual branches of the chemical industry; in this paper, however, we will simply give several examples of restructuring efforts in this industry (including programs already put into effect, those being implemented and some of the plans for the near future). Among other things, these activities include the following:

--an overall change in the production profile of the soda factory at Krakow, which will discontinue production of soda ash and ammonium chloride as difficult lines of production and replace them with other products;

--a partial change of the production profile (caused by various factors) of many other plants, including: chemical fiber enterprise Chemitex-Celwiskoza at Jelenia Gora, chemical fiber enterprise Chemitex-Wistom at Tomaszow Mazowiecki and several plants in Katowice Province;

--setting the chemical industry and related industries free of the import of industrial lubricants and their derivatives as a result of building Polish plants for processing and purification of industrial lubricants;

--partial change of the production profile of plastic materials, including, among other things, introduction of capacity for production of PVC in Wloclawek and concentration of the development of plastic materials on so-called small-bulk (construction) materials;

--changing the existing polyethylene production capacity in Plock for the so-called polyethylene, which will result in an improvement of consumer quality of this material (retaining the same output); and

--change of the kinds of synthetic fibers, particularly polyester fibers (mainly by producing thinner fibers), which will greatly improve the effect of utilization of these materials in textile industry without increasing the weight output.

Development of the Chemical Industry in 1986-90

For more than a year the ministry has been working intensely on preparing a proposal for the National Socioeconomic Plan [NPSG] for the current five-year period from 1986 to 1990. The draft of the plan is being prepared by the Planning Commission of the Council of Ministers, and the final version, after its approval by the Council of Ministers, will be adopted by the legislative Sejm. The information presented in this section should be viewed as the directions of development of the fuel and chemical industry suggested by the ministry without any guarantees that all of the actions listed here will be implemented before 1990. Substantial changes are also possible, but these--because of frequent previous consultations with the central planning agency--are less likely. The basic principles of restructuring and development of the chemical and fuel industry in Poland up to 1990, as outlined in these documents, can be reduced to the following objectives:

(1) undertaking all necessary technical and financial actions to halt depreciation of basic stock in all branches of the chemical industry;

(2) intensifying the activities initiated already in the previous years toward improving the economic efficiency by reducing the spending of materials, energy and foreign currency per unit of product while at the same time raising the productivity of labor;

(3) in view of the difficult socioeconomic situation in the country, selecting areas of development of the chemical industry to be assigned priority in Poland; these include products for agriculture and the food industry, health service and hygiene products and an increase of exports. Priority is also assigned to investments aimed at environmental protection;

(4) allocating for the priority areas of restructring and investment in the chemical and fuel industry appropriate funds (a minimum of 390 billion zlotys), stipulating that for the most part this will be investment by enterprises from their own funds combined with bank credits and partial contribution from the national budget (mainly in the form of tax exemptions and subsidies); and

(5) Achieving an output growth in 1990 as against 1985 equal to 123 percent (in the chemical industry) and 111 percent (in fuels). In addition, the growth of consumer goods in that period should be at a minimum 123 percent. Exports should grow to a level resulting in a 166 percent increase in the planned period (exports to socialist countries) and 128 percent (to capitalist countries).

These main principles of restructuring and development of the chemical and fuel industry in the coming years will assume different forms in the various branches of this industry. A brief overview of the modernization and development plans for some of the branches up to 1990 is given below.

Mining of Chemical Raw Materials

In view of a progressive depletion of mined deposits, the main objective in this area is creating in new locations mining capacities and, in addition, increasing (to the extent possible) the degree of beneficiation of minerals extracted.

The major new investments will include the building of a sulfur mine on the Osiek deposit (in view of the depletion of the deposit at Grzybow) and the building of a rock salt mine at the Lanieta deposit (in view of the imminent closure of the Klodawa mine). In addition, the construction of salt mines at Moszczenica and Mogilnia will be continued. There are also plans to start the exploitation of the gypsum deposit Radlowka and to increase the output and concentration degree of minerals, such as barite, fluorite, anhydrite, silica, chalk and others.

Petrochemical and Refining Industry

Most of the operations in the processing of crude oil often predetermine the production potential of the chemical industry and, in a broader sense, are crucial for important spheres of the national economy. In view of the well-known limitations in the purchase of oil (domestic output accounts for just 1 to 2 percent of consumption), it is not expected that in the next few years the existing production capacities for refining this raw material could be fully utilized. We can only hope that in the late 1980's the foreign currency situation will make it possible to purchase more crude, so that its refining could be expanded, improving Poland's fuel balance.

Among investments planned, the main emphasis is on modernization and renovation of capacities. The more important activities include modernization of the oil plant and reconstruction of refining facilities at Plock, partial reconstruction or modernization of the solid lubricant plant and installation of hydrorefining for basic oils at Czechowicy and the construction of a solvent plant and installation of used oil recovery plant at Trzebinia.

Despite the current underutilization of oil refining capacity, it is assumed that in the 1990's the processing of crude should grow to exceed the current

capacity. For this reason there are plans in 1990 to start building a new refinery in Poland.

The basic construction project in the petrochemical industry in the next few years is the building of a benzene pyrolysis installation to produce 100,000 to 150,000 metric tons of ethylene annually. A number of other projects must be implemented, including:

--modernization and expansion of existing alkene, phenol, ethylene oxide and glycol plants;

--modernization of polyalkene plants and increases of their productivity, mainly as a basis for plastic materials;

--modernization and expansion of the "styrene complex" (benzene, ethylobenzene, styrene, polystyrene and copolymers); and

--reconstruction and modernization of some of the plants producing raw materials for artificial fiber, especially polyamide (including change of raw material base for cyclohexanol).

Whether all of these plans could be implemented before 1990 wil be determined, as has been mentioned in the final version of the construction plan, in the framework of NPSG. This comment actually applies to all of the subindustries.

Production of Artificial Fertilizers

In this area the chemical industry is to fulfill an important assignment with respect to agriculture and the national food production program. It is envisaged that in 1990 the average national fertilizer use will be 220 to 230 kg of fertilizer per hectare (including the import of potassium fertilizers). It will be possible to reach this level by producing at that time 1.67 million metric tons of nitrogen annually as a component of nitrogen fertilizer (an increase of 33 percent compared with 1985) and 1.086 metric tons of P_2O_5 annually as a component of phosphate fertilizer (a rise of 22 percent compared with 1985). This substantial growth of output, combined with an improvement of the product mix, will be achieved only if a number of capital investments are implemented, including the following most important projects:

--completing the building of Police II complex;

--building oxygen-nitrogen units at Kedzierzyn and Pulawy;

--dismantling of more than a dozen ammonia synthesis reactors at Kedzierzyn and replacing them with one modern plant (a similar operation is planned at Tarnow, but for a later time);

--dismantling the existing and building new carbamide and ammonium nitrite plant at Kedzierzyn and nitric acid and ammonium nitrite plant at Tarnow;

--replacement of carbamide plants at Pulawy with modern units;

--modernization and reconstruction of phosphoric acid and triple superphosphate plant at Gdanks; and

--modernization and reconstruction of simple superphosphate at Uboce, Wroclaw, Tarnowbrzeg and Torun.

In addition, nitrogen and phosphate fertilizer will make in the near future investments in measures for environment protection. This includes a biological effluent treatment facility at Pulawy (for the entire factory), management of phosphate gypsum waste at Gdansk and reduction of gas emissions in several plants of the phosphorus industry.

Organic Chemistry Plants

Plans concerning the development of this subindustry are described for the individual branches.

In particular, in the area of pesticides a number of new construction projects are planned for the coming five years, which are all covered under the plans of chemicalization of agriculture. This will include primarily the construction of bromophenylvinyl phosphate plant at Jaworznia and chloridazone (pyrazone) and metadichlorobenzene plant at the organic chemistry plant Rokita on the Odra at Brzeg Dolny. A large number of investments in environmental protection facilities, including the management of industrial effluents at Jaworznia, are planned.

In the paint industry no major investments are planned for the coming five years. The plans in this industry are focused on restructuring, including the following main actions:

--limiting or eliminating the production of items that have experienced a drop in demand or items that for various reasons cannot be produced, while increasing the output of products in greater demand, for example, benzene-free, sulfuric, suspension and other paints;

--discontinuation of products involving foreign currency expenditures or limitation of their quantity;

--production of larger quantities of semiconductors (including the types currently imported), which until now have been in short supply; and

--radical improvement of the situation in the paint and varnish industry concerning occupational safety and environmental protection.

In the photochemical industry certain restructuring efforts will be undertaken to meet in the nearest future the demand for roll and sheet photographic film and basic photochemicals. To complete this information, it should be added that already Foton Enterprises are fully satisfying the demand for medical film and black-and-white photographic paper.

The Chemical Fiber Industry

This industry, and especially the production of viscose synthetic fiber, requires intensive modernization and renovation efforts. At this point it is unclear whether the available funds will enable the implementation of all the plans (to a certain degree this will depend on the profits of the enterprises); nevertheless, in the substantive program, to be partially implemented after 1990, the following items must be included:

--the construction of a central ventilation and air treatment station with a chimney and participation in the building of interfactory effluent treatment facility at Chodakowski chemical fiber plant Chemitex at Sochaczew;

--limiting the emissions of carbon disulfide and hydrogen sulfide at chemical fiber enterprise Chemitex-Celwiskoza at Jelenia Gora;

--building a mechanical and chemical effluent treatment facility at chemical fiber enterprise Chemitex-Wiskord at Szczecin;

--building and modernizing an artificial modified silk plant at chemical fiber enterprise Chemitex-Wiston at Tomaszow Mazowiecki;

--modernizing the output of viscose silk combined with investment in environmental protection at chemical fiber enterprise Chemitex in Wroclaw;

--intensified output of technical polyamide silk at chemical fiber enterprise Chemitex-Stilon in Gorzow Wielkopolski;

--launching the production of technical polyester silk at chemical fiber enterprise Chemitex-Elana at Torun; and

--modernizing and intensifying the output of polyacryl nitrylic fibers and the building of a latex thread plant at chemical fiber enterprise Chemitex-Anilana at Lodz.

The Pharmaceutical Industry

This branch of the chemical industry will be expanded in the nearest future, as ensured, among other things, by decree 36-85 of the Council of Ministers on 22 Mar 1985. The plans for development of the Polish pharmaceutical industry are connected with the continuously growing demand for drugs and medical equipment in the country, as well as plans for substantial increase of drug exports.

The Polish chemical industry is already an important supplier of drugs, both to socialist and capitalist countries. This is an efficient branch of export, where the amount of products shipped is relatively small and the basic object of export is the result of technological research and development. It is expected that in the nearest future, after the antibiotics factory at Tarchomin has been put into full production, exports, particularly to hard currency nations, will be greatly increased. At the same time, the plans for expanding the Polish pharmaceutical industry in the next five years must

increase the output of these products to domestic markets, as well as a large expansion of exports to socialist countries, primarily the USSR.

In addition to large construction projects, actions will be undertaken to achieve limited restructuring with the following main components:

--ensuring domestic sources for production of certain materials and semi-finished products, which until now has limited the development and output of the pharmaceutical industry;

--changes in the proportion of the production capacity for active substances of drugs and drug vehicles (until now the latter have been predominant) by putting into operation in the Polish pharmaceutical industry a large number of new plants for drug synthesis (this concerns mainly factories at Starogard Gdanski, Pabianicy, Kutnia and Jelenia Gora);

--changes in the product mix of drugs manufactured; there are plans to increase the share of anticoagulants, antihypertensives, antirheumatics and psychotropic drugs as a proportion of the total pharmaceutical output while reducing the relative proportion of antibiotics, sulfonamides, vitamins and antituberculosis drugs; and

--substantial increase in the output of disposable medical products, mainly syringes, needles, blood transfusion devices, droppers, etc.

This large-scale investment and modernization in the pharmaceutical industry will take up in 1986-90 a large allocation of funds, exceeding 65 billion zlotys.

The Rubber Industry

This branch of industry has an important role to play in industial cooperation, because most of its products (some 75 percent) are necessary supplies for mining, car-making, engineering and many other industries. About 20 percent are consumer goods in short supply, mainly rubber foot-wear, tourism and sports goods and many others. As a result, only 5 percent of the output is intended for export, although a much larger demand would be available.

The plans for the development of the rubber industry include mainly increasing production capacities for practically all items. Unfortunately, the limited investment funds and foreign currency quotas necessary for purchasing some of the important raw materials abroad (organic and synthetic rubber, certain kinds of carbon black, cord and other products) are responsible for the fact that this program reflects possibility more than demand.

The important items of rubber industry development in the coming years are:

--building a plant for tractor rear wheel tires at Olsztyn (a first stage in the construction of so-called OZOS III);

--increasing the output of tractor front wheel and farm machine tires at Debica;

--expanding the production capacity of high-pressure towers at Bydgoszcz and conveyor belts at Wolbrom;

--increasing the output of rubber footwear and expanding the product mix; and

--substantially improving the capacity of tire protector plants.

An important item of the rubber industry plan is the effort needed to improve the quality of tires, which eventually extends their service life.

* * *

Due to shortage of space, it is impossible to discuss all the branches of the chemical industry or all or even most important items in the development program of this industry in the coming years. Yet, a number of additional projects to be implemented before 1990 should be mentioned. These are the plans to build:

--a factory of polyformaldehyde and cyanic chloride at Tarnow nitrogen enterprises;

--a factory of PCV furniture finishing materials at Zory;

--a plant for production of alkylobenzene and benzylchloride and their derivatives at Oswiecin;

--a factory of technical carbon black at Gliwice;

--a fatty acid and coconut oil processing facility at Nowy Dwor; and also

--modernization of the carbide industry;

--expansion of the cosmetic factory Miraculum at Krakow; and

--expansion of the polycrystalline silicon plant at Tarnow.

All these construction projects and other, lesser but equally important, ones not mentioned here form an ambitious program of "mobilizing" the development of the chemical industry in Poland after more than a decade of stagnation. It is, however, not only a challenge for the Polish chemical workers but a program of general national importance which will largely determine the situation of the Polish economy at the beginning of the 21st century.

[Box]

Jerzy Paprocki, MSc (Eng), was graduated in 1954 from the chemical department of Szczecin Polytechnical Institute and in 1956 the chemical department of the Silesian Polytechnical Institute at Gliwice. He is the chief specialist of the development department of the Ministry of Chemical and Light Industries, specializing in chemical engineering.

9922
CSO: 2602/22

YUGOSLAV ACHIEVEMENTS IN SUPERCONDUCTIVITY

Initial Achievements Noted

Zagreb VJESNIK (SEDAM DANA Supplement) in Serbo-Croatian 7 Mar 87 pp 12, 13

[Article by Marika Toth: "New Superbarrier Broken"]

[Text] In recent months the limits of superconductivity have been greatly exceeded. It is clear that something epoch-making is taking place in this area, and the consequences of these developments could take us into a new technological revolution like the one introduced by the discovery of electric energy. What is especially important is that Yugoslav scientists are achieving results in this race almost measuring up to the world level.

Superconductivity has recently become a hit topic, and not just in scientific circles. At the beginning of February PANORAMA SUBOTOM published an article about it by Dr Slaven Barisic, and the search for materials which become superconductive at ever higher temperatures is a race by marathon runners who do not know where their goal is but who do know that they are getting near it and hope that they will reach it before others do. The results are changing almost daily. In less than a month we have learned that scientists around the world have achieved superconductivity at 36, 40, 70, and 90 degrees on the Kelvin scale and even higher, that is, this number of degrees above absolute zero (which we know to be minus 273 degrees Celsius).

The best thing is that a state of tension has arisen in our laboratories, and not without reason. Scientists of the University's Institute of Physics, the Ruder Boskovic Institute, and the school of natural science and mathematics in Zagreb have succeeded in causing superconductivity at 38 degrees Kelvin, thereby entering the race with an increasing number of scientists around the world. They have reason to do so, inasmuch as it has been a long time since a giant step such as this has been taken in science. From 1911, when superconductivity was discovered at around 4 degrees Kelvin, to 1973 the superconductivity threshold was not raised above 23 degrees Kelvin. Only in recent months has this limit been exceeded, and widely exceeded. Clearly something epoch-making is taking place here; barriers have been broken. The consequences of these developments could take us into a new technological revolution like the one introduced by the discovery of electric energy. This

revolution would make itself felt essentially in all areas of life and would take us into new fields as yet unheard of and unknown.

Superconductivity is the property of matter of conducting electric energy without any resistance, that is, without any loss of this energy. Loss-free transmission of energy and even storing it have been dreams of scientists since the time it was discovered that superconductivity exists. The trouble is that materials have to be chilled to very low temperatures, and this is not easy to accomplish. Temperatures near absolute zero can be reached by refrigeration with liquid helium, and liquid oxygen is suitable for ones around 20 degrees Kelvin, but both elements have their drawbacks, above all the cost. In the case of superconductivity this also includes the cost of refrigeration, chiefly with expensive helium. Consequently, one of the basic aims has been to achieve superconductivity at a temperature higher than 77 degrees Kelvin, for then it would be possible to refrigerate with liquid nitrogen, an element which is present in abundance in the atmosphere and which is not as expensive to convert to a liquid. The most recent superconductivity limit, and thus far the highest one, has been reached precisely with liquid nitrogen.

We do not know as yet how this has been managed. The latest issue of TIME (2 March) reports that Maw-kuenwu, a physicist at Alabama University in Huntsville in the United States has caused superconductivity at 93 degrees Kelvin, that he is working in a group headed by physicist Paul C. W. Chu of the University of Houston, and that this group has succeeded in causing superconductivity even at 98 degrees Kelvin. No indication is given of the conditions under which this has been accomplished (whether at atmospheric or higher pressure), or of the materials used. Physicist Chu, however, promises that everything will be described in detail in new issue of the journal PHYSICAL REVIEW LETTERS, but also that both the material and the process will be patented.

The Materials are no Secret

For these reasons it is important for our scientists as well to enter the race for higher superconductivity temperatures and for them to obtain significant results quickly in the race. Although 38 degrees Kelvin may no longer seem to be spectacular as the threshold of superconductivity in comparison to a potential 98 degrees Kelvin, it does mean that even higher temperatures could be reached, but for purposes of comparison and evaluation of results it will also be important to compare both the conditions and the material with which these conditions are created.

The nucleus of the research group in Zagreb is made up of Dr Nevenka Brnicevic, a chemist of the Ruder Boskovic Institute, and physicists Mladen Prester of the Physics Institute of the University and Dr Amir Hamzic of the School of Natural Sciences and Mathematics. Dr Brnicevic prepares the alloys whose superconductivity is to be tested. Every day she puts them into carefully marked test tubes, which she takes to the far-off Physics Institute. At the institute, Mladen Prester places them in apparatus which is connected to a helium liquefier and which automatically measures temperature and

resistance. Also usually with them is Dr Amir Hamzic, who contributes his expertise in conducting experiments, and all three closely watch the screen of the computer monitor waiting for the current parameters to be displayed.

"We were able to achieve superconductivity relatively rapidly at this relatively high temperature because the properties of new materials have been undergoing testing at our institutes for 10 to 12 years now," states Mladen Prester. "At the Physics Institute, for example, we are investigating organic and inorganic chained conductors, ones which are good conductors at room temperature and become superconductive at low temperatures. We are interested not just in superconductivity but in many other properties of states of matter which do not exist or are unstable under natural conditions. Hence we have already published many papers in this area. The report received at the beginning of the year from Switzerland on superconductivity achieved at relatively high temperatures (around 40 degrees Kelvin) resulted in only little reorientation of our research.

"Our collaboration began when I came to the Physics Institute one day," says Dr Brnicevic, "to have the potential superconductivity temperature measured in a cluster of metal atoms containing 6 atoms of tantalum in a direct metal-to-metal bond; that is, the distance between the atoms was smaller than in the metal tantalum itself. I wanted to have the superconductivity measured because this substance is analogous to certain other ones (such as a hexametric molybdenum cluster) in which superconductivity has been found at 15 degrees Kelvin, along with a high critical field (a critical field is the force of a magnetic field which destroys superconductivity)."

"After news was received that in Zurich a relatively high temperature of transition to superconductivity had been reached with a lanthanum, copper, and oxygen alloy as the basic alloy, we agreed that we would conduct research together in this area."

Superconductivity a Collective State

The basic alloy (La2 CuO4) is not superconductive, and at ordinary temperatures is even an insulator. But in 1973 superconductivity was achieved with it at 23 degrees Kelvin by adding barium to it, and the superconductivity at 70 degrees Kelvin allegedly achieved in China (at the beginning of 1987, according to RENMIN RIBAA) appears to be based on it. Hence it is not surprising that our scientists have proceeded in this direction.

Strontium was selected as an additive to the lanthanum, copper, and oxygen alloy. Lanthanum is not especially rare and is not particularly expensive, while strontium (not the radioactive variety) and cooper are even cheaper, and this is a step toward potential future application. Samples are modified by varying the amount of lanthanum removed and adding strontium. The number of their atoms must be constant, and the percentage of strontium must be very low. We do not as yet know which combination will prove to be the most suitable one. The best reproducible results have been obtained thus far with the allow La11.85Sr0.15CuO4. Another variable factor is the method of processing the components to form the alloy in the process of precipitation and heat treatment. What is obtained more or less looks like a flattened

black stone and is in fact a ceramic. Dr Brnicevic is now embedding fine wires in this "stone" in order to connect the latter to a power supply source.

As Dr Brnicevic explains it, the structure of the system is altered by addition of strontium and processing. The purely rhomboid shape of the lanthanum and copper oxide alloy becomes a tetragonal one representing a system of higher symmetry. Scientists around the world are currently trying to prepare a monocrystal, which could be used to determine the precise position of all the elements and the interatomic distances in the crystal lattice and accordingly to decide if some substance other than strontium would be more favorable as an additive.

The crystal lattice in turn is important because its vibrations or phonons (elementary vibratory energy in the crystal lattice) can be used to explain, on the basis of the Bardeen-Cooper-Schrieffer theory, electron pair bonding, that is, the phenomenon that electrons, although having similar charges, cease to repel and begin to attract each other, thereby becoming superconductive. In the state of superconductivity the entire macroscopic material is characterized by only two quantities (phase and amplitude) rather than by a great number of electronic coordinates. Hence reference is made to a collective state and collective conductivity mechanisms in the superconductive state.

"The challenge to science," says Prester, "is to discover and understand the reason for superconductivity at relatively high temperatures. It remains to determine if electron pair bonding results from some cause other than the phonon effect or to find the only combination of properties of matter which will lead to superconductivity under the BCS theory."

Profitable Even with Helium

"All we have to do now is measure, measure, measure," explains Dr Amir Hamzic, adding that everyone still has a great amount of work to do, inasmuch as it remains to determine which alloy is the optimum from the viewpoint of the magnetic properties of a material.

Dr Hamzic states that superconductivity is economically feasible and that it is being applied even now, at two levels. They are the macrosystems level, in power engineering and transportation, and the microsystems level, for example in medicine and electronics. Even though liquid helium is expensive and must be recycled (if for no other reason than its cost; it is too costly to be released into the atmosphere), small engines are now being made for airplanes and ships in which superconductivity is applied, because in this way the engines are less bulky. Because of the absence of resistance, and consequently because there is no loss of energy, power generators for more than 500 megawatts are more economical if they use superconductivity, and it has been calculated that such is also the case with transmission of more than 2 gigawatts of electric power, although it would be necessary to set up a helium liquefaction station every 10 kilometers and accordingly to have special insulating materials. Dr Hamzic says among other things that superconductivity is already being used in Japan to create the strong magnetic field through which the Japanese fast trains move and that Energoinvest in

Sarajevo is developing magnetic hydrodynamic generators in which superconductivity is to be used.

The application of superconductivity in electronics has also gone further in Japan; it is based on use of the Josephson effect (tunneling, the movement of electron pairs through the oxide layer separating two superconductors) as a switch. This avoids the generation of heat, and this in turn allows a higher degree of integration and growth, along with a higher operating speed in comparison with semiconductor-based computers.

Superconductivity is already being used for diagnosis in medicine, for detection of such weak magnetic fields as 10-15 Tesla (for the sake of comparison, we note that the Earth's magnetic field is 10-15 Tesla); the magnetic fields of the heart and brain muscle nerve are of this order of magnitude. This is a non-contact, non-invasive method and is so accurate that it can detect epileptic centers in the brain. Nuclear magnetic resonance, that is, diagnosis by means of stronger magnetic fields than are obtained with superconductivity, is also used in medical applications.

Several years usually pass from the time a scientific discovery is made and the time it comes into wide use (20 years passed from the time of discovery of superconductivity until its first application). Consequently, we cannot expect miracles to happen tomorrow, even though the interval between discovery and application has become much shorter in recent decades. It is good to know, though, that our scientists are not lagging behind others around the world but are marching in step with then, at least insofar as superconductivity is concerned, and that those in Zagreb will try to bring together all Yugoslav scientists who have the ability and the interest in working in this area.

Superconductivity at 91 degrees Kelvin

Zagreb VJESNIK in Serbo-Croatian 14 Mar 87 pp 1, 3

[Unsigned article: "Worldwide Success of Zagreb Scientists: Superconductivity at 91 Degrees Kelvin"]

[Text] Zagreb (M.T.). It was expected, it was wanted, and it happened. Our scientists have succeeded in causing superconductivity at a relatively high temperature of 91 to 71 degrees Kelvin and so have almost matched the achievements of scientists at the University of Houston in the United States. As we were informed Friday by Mladen Prester of the Physics Institute of Zagreb University, he and his colleagues Dr Nevenka Brnicevic (of the Ruder Boskovic Institute), Dr Amir Hamzic (of the School of Natural Sciences and Mathematics), and Marko Miljak (also of the Physics Institute) have succeeded in making the transition to superconductivity in an alloy of yttrium, barium, and copper oxide ($Y_{1.2}\ Ba_{0.8}\ CuO_4$) similar to the one with which superconductivity was reached in the United States at 92 degrees Kelvin. Our scientists are conducting further research, and according to Mladen Prester will not only strive to reach higher temperatures but will investigate all the aspects of superconductivity more thoroughly.

Hence the race continues among scientists to cause superconductivity at the highest possible temperature, inasmuch as superconductivity is a phenomenon which completely eliminates electrical resistance and which if widely applied could cause a new technological revolution. This effect was previously restricted to temperatures around absolute zero (zero degrees Kelvin or around minus 273 degrees Celsius), and practical application was inconceivable because only costly liquid helium could be used to reach such low temperatures. In recent weeks, and even days, the temperatures at which superconductivity has been reached have shot up at a dizzying pace. The temperatures reached in Zagreb and at the University of Houston can be induced with liquid nitrogen, and a step has been taken today toward application of superconductivity which is much greater than the one made possible by the earlier discovery.

Dr Nevenka Brnicevic, a chemist, told us that samples used in testing superconductivity are prepared in two ways, by a lengthy process taking about 4 days and by a shorter one lasting 2 days. Thus far the highest superconductivity threshold temperature has been reached with a sample obtained by the shorter process, but the longer one is also being tested in an effort to find the optimum combination of superconductivity properties and other, primarily magnetic, properties. It is important for our scientists to learn from the Americans precisely which alloy was used to achieve the sensational superconductivity, but the process for producing the alloy will have to be worked out in Zagreb.

According to information given to us by the scientists, specialists of the Rade Koncar Composite Associated Labor Organization have already taken an interest in their work. These specialists want their research workers to keep abreast of this basic research from the very beginning so that consideration may be given now to potential application of these major results.

6115
CSO: 2802/4

HUNGARY: CAD/CAM APPLICATIONS LAG BEHIND RESEARCH

Budapest HETI VILAGGAZDASAG in Hungarian No 3, 17 Jan 87 pp 52-54

[Article by Zoltan Tompe: "Hungarian Plodding." In the title the Hungarian word for "plodding" (cammogas) has the first three letters capitalized--"CAMmogas."]

[Excerpts] On television recently the leader of a domestic scientific research institute emphasized the--otherwise obvious--fact that in healthy economies technical development is not a matter of central resolutions but rather of the well conceived interests of the enterprises themselves. The rocky road of the domestic spread of computerized manufacturing systems shows virtually as a model that if technical development is not of interest to the producers then the fault is to be sought not primarily in them but rather in the economic-social environment determining their behavior.

One could say that a Hungarian school has developed in CAD/CAM scientific research. Even well known foreign experts in computerized design gladly come to Budapest to exchange experiences. The machine industry automation main department of the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] engages in scientific cooperation with the CAD research group in the engineering school of Cambridge University within the framework of which they exchange software technology and know-how. Competitive Hungarian scientific results are born at the Central Physics Research Institute of the MTA and at SZAMALK [Computer Technology Applications Enterprise] as well as at the SZTAKI, and CAD/CAM development is under way at a number of other domestic enterprises and institutions as well.

This research and development achievement has arisen with a research infrastructural background orders of magnitude behind that of the foreign competitors, with a poor supply of tools and with a relatively undeveloped industry.

The relatively developed domestic CAD/CAM research and development is in vain. Disregarding a few pioneers the idea of CAD/CAM is not dealt with at all in the great majority of Hungarian industry and in some places they only flirt with it at an entirely initial level. In an interesting way we can find examples in Hungary of the industrial scale application of this technique at the very successful large machine industry enterprises and at those struggling

with serious problems (Raba, Ikarus, the Csepel Machine Tool Factory and Ganz MAVAG). These enterprises have discovered that the number one condition for staying on their feet and being competitive is automation. It appears that here one must be very successful or very unsuccessful to recognize this. The comfortable and secure gray mediocrity is not favorable for such a recognition. Even in the case of the few good domestic examples we are talking primarily about using the simpler, drawing CAD, although industrial scale experiments are under way on form modeling CAD as well. Due to the lack of conditions CIM [computer integrated manufacture] does not appear even as a demand.

So in regard to the average of Hungarian industry CAD/CAM is for the time being only a naive dream or childish game of the engineers. Why this is so can be explained in significant part by the contradictions of the domestic economic environment. We might name one cause the "user threshold." In Western countries in most cases the pay of an engineer is comparable to the cost of the computerized shop in which he works. There one can get a really good CAD machine for the monthly pay of one engineer. In Hungary one can get the same CAD machine for the annual income of 50-60 or even 100 engineers. Even if the market conditions were to force the Hungarian enterprises to automate as in the West the enterprise director might justly ask: "Why should I have the design documentation drawn with a computer? I'll put three engineers on it, that will cost at most 250,000-300,000 forints per year, while the annual amortization on a good computer is ten times as much...."

The shortage economy and the comfortable monopoly status do not require most domestic enterprises to automate and shorten production throughput times. Indeed, because of the excessively expensive automation the price of the final product might increase too, which might arouse the dissatisfaction of both customers and price authorities. Automation has a dual effect--it decreases prices by virtue of its efficiency and increases them as result of its expensiveness. For us today the latter effect is still the stronger.

It is worth illustrating this with an example. Let us presume that a Hungarian factory can produce 10,000 units of some item per year. If it automates it could produce 100,000 units, substantially more cheaply per unit than before. But if it manufactures only 10,000-20,000 units per year with this new technology then each unit becomes more expensive. Since the domestic market is restricted the domestic demand for the product in our example is only--let us presume--20,000 per year. If the product cannot be sold on the capitalist market, because of its cost and being out of date, and if the rigidity of the 5-year plan contingents in socialist foreign trade do not tolerate a more significant increase then the factory stays with the 10,000 units per year manufactured in the traditional way. True, this only satisfies half of the domestic demand, but it is cheaper than if manufacture were automated.

It is also well known that the efforts of the majority of Hungarian industrial enterprises are directed at the next 3-6 months or one year. Regulation puts short-term goals in an especially important position. In general the enterprise is interested in exploiting to the maximum the machines it wrote off to zero years since. In his nightmares the leader of an industrial enterprise trembles at the thought of what would happen if his 15-25 year old

machinery inventory were to give up all at once. Even in his dreams he cannot really think about a flexible manufacturing system or CIM.

More than a few formulate their opinion even today somewhat as follows: "What do you want with CAD or CIM? We cannot manufacture even an honest screwdriver! Let us remain on the soil of realities, there are a lot of tasks we must solve before CAD/CAM." What can one answer to this? Probably many said at the time to Gutenberg that book printing was not needed, since 99 percent of the people could not even read. Should the discovery of book printing have waited until everyone learned to read and write? On the contrary, book printing created the technical base for the liquidation of illiteracy. And computerized techniques represent the driving force which creates the technical base for a suitable quality, competitive industry. Probably what hides behind the quoted false argument is that many are inclined to underestimate what they do not understand.

Even if we disregard the economic contradictions and awareness limitations the lack of suitable computer hardware still puts obstacles before the domestic spread of CAD/CAM. The home microcomputers most commonly owned by enterprises in Hungary today cannot produce the necessary performance and were not even invented for CAD/CAM purposes.

From this viewpoint--taking into consideration the computers which can be found here at present--the systems of socialist manufacture best approximate the requirements of computerized manufacturing systems. The joint computer technology program of the socialist countries (ESZR) at the end of the 1960's and beginning of the 1970's did much to spread computer technology and start applications. At the same time, unfortunately, the ESZR computers did much to run down computer technology here at home. To a large extent we can write to this account the development of a domestic reflex according to which a computer is a machine which is constantly broken or breaking, devours money, is unreliable, has spare parts you have to wait months for and produces kilos of unusable fanfold paper. Although such problems are decreasing today the unreliability of the machines and the poor service still cause many headaches for users. So even today one can hardly with a clear conscience advise a factory director to entrust the entire production process of a factory to an ESZR system.

And if an enterprise finally succeeds in getting hardware suitable for the purpose then, naturally, it also needs software. Thanks to the hundreds of small software undertakings the supply of computerized designing software, for example, should be capable of accomodating flexibly to demand. But demand is uniquely distorted. There are more and more economic leaders who have been convinced of the utility of computer technology but there are still few who are convinced of the utility of buying software. And it is very easy to copy a computer program. A routine expert can steal even a protected program. So why spend the money? think many Hungarian users to themselves. It is an open secret in professional circles that the larger part of domestic software trade is simple barter. "What you have, I have too." There are enterprises where 70 percent of their software was obtained on such a "friendly" basis.

Not to speak of the ethical aspect of the matter now, such "cheap" programs can hardly be used. It is not certain that the stolen program precisely meets the desired applications goal, in general there are no adequate instructions for use, it is difficult to repair or develop further, naturally it is not accompanied by instruction or guarantee. So then it frequently turns out that the cheap software is the most expensive. So the inexperience of users and the false awareness connected with software also hold back the spread of valuable applications.

In the international economic Marathon race Hungarian industry has been seeing the backs of Western Europe for decades. Now we can hardly see their backs, and new runners surround us, the Southeast Asians. Their technological, automation and computerization levels are a good bit ahead of the domestic levels but the Hungarian position is not yet entirely lost in highly qualified work and tasks demanding a serious intellectual contribution. But if the Hungarian economy is not capable of at least putting into practice quickly its own scientific achievements then this group of countries will overtake us.

The SYSTEC '86 electronics exhibit held in Munich at the end of October also proved in a spectacular way with what great impetus the developed countries are moving in the direction of CIM. Robert Eaton, vice president of General Motors, put it this way: "There will be a bigger change in manufacturing technology in the next 15 years than in the past 75 years put together. As quickly as possible the manufacturers must work out clear, long-range goals for products, markets and efficient manufacturing methods. The significance of CIM must be understood and its possibilities must be exploited. Any enterprise which does not do this will fall."

8984
CSO: 2502/58

HUNGARY: CAD SYSTEM FOR DESIGN OF PRINTED CIRCUIT BOARDS

Budapest HIRADASTECHNIKA in Hungarian No 3, 1987 pp 126-132

[Article by Sandor Radai and Gyorgy Mihalyi, of the BHG (Beloiannisz Communications Engineering Factory) Developmental Institute: "Computer Aided Design of Printed Circuit Boards at the BHG"]

[Text] Summary

The article describes the further development of a CAD configuration based on the TPA 1140 into a system based on the TPA 1148, together with software developments supporting CAD work. The authors then discuss supplementation of the AUTER system with color graphic designing terminals which, in addition to possibilities for graphic correction of AUTER tasks, make possible the execution of simpler PCB designing tasks on the screen.

Introduction

Between 1979 and 1981, within the framework of the Central Program for Computer Technology guided by the Ministry of Industry and the OMFB [National Technical Development Committee], computerized designing systems, consisting essentially of the same configuration, were created at three large enterprises in Budapest which manufacture electronic equipment, primarily for a higher level solution of designing tasks for printed circuit boards and for creation of the tool like technological documentation (master films, NC tapes, accompanying lists, etc.) needed for manufacture. The computer configuration and working system created at the Telephone Factory was described in detail in HIRADASTECHNIKA, No 10, 1984. Systems entirely similar to this were also created at the EMG [Electronic Measuring Instruments Factory] and the BHG, the latter within the framework of its Developmental Institute.

In the foreign professional literature such systems are embraced by the concept CAD (Computer Aided Design). In domestic practice the three identical configurations mentioned bear the name AUTER system, a designation made up of the words AUtomatikus TERvezes [automatic designing].

The previous articles already mentioned described the conditions for creation of the AUTER systems and the configurations realized in the first phase of their creation. The experiences of the first years following putting them into

operation made necessary an urgent further development of these systems, partly in the direction of increasing the performance of the basic configuration and partly in the direction of an expansion with direct access, graphic interactive designing work stations. Our article is intended to describe the essence and results of this latter developmental work.

1. Expanding the Computer Configuration of the AUTER System

The central computer of the AUTER system was a TPA-1140 manufactured by the KFKI [Central Physics Research Institute].

This configuration was characterized by an operating memory capacity of 256 K bytes. Connected to the central unit were four hard disk stores with a capacity of 2.5 M bytes each, two magnetic tape stores, one line printer, one plotter, one tape punch, one tape reader and five alphanumeric display terminals, all on-line, with each terminal supplemented by a matrix printer.

After being put in use the configuration worked under the DOS-VS/RSX 11 M 4.0 operating system.

The AUTER system had image digitizing tables as an input device and a high precision, flat, light write-head plotter (FOTOPLOTTER) as an output device, both off-line.

As user programs the system had the KONSTR-M printed circuit designing program package and FILM3 program package to prepare manufacturing documentation, packages developed by the Telecommunications Research Institute, and programs suitable for simulation of certain functions of printed circuits.

The starting information for the FILM3 program was the topology and geometry of maximally designed wiring, which could be communicated to the program by digitizing the circuit layout or with alphanumeric input through the keyboard.

The starting information for the KONSTR-M program could be the circuit diagram or logic diagram of the designed circuit, which could be typed into the system alphanumerically through the keyboard with appropriate coding using the so-called KONSTR parts models. Using the contents of its own model databank this program system created a parts layout and then prepared wiring for it within the card format given for various parameters in one, two or possibly more conducting layers. In every phase of this designing process there is a need and a way for interactive intervention by the designer or for his approval phase by phase. After final approval the program also creates the data carriers which control the peripherals preparing the documentation.

The FILM3 program package also produces data carriers controlling peripherals which prepare documentation, but the types of documentation generated by KONSTR-M and FILM3 do not look entirely the same because the two program systems do not use the same boundary conditions and design rules.

The above gives only a very sketchy overview of the basic system created. Within a short time of putting it into use it became obvious that because of sticking to designing traditions the great majority of the tasks being run on

the AUTER system were of the FILM3 type. The method of description and subsequent interactive terminal work suiting the KONSTR-M program were received with antipathy by the customary way of thinking and routine of designers and it also became doubtful whether the combined capacity of the KONSTR-M program system and the TPA 1140 configuration was sufficient for solving tasks requiring more complicated, precise drawings, greater density and larger page sizes.

It appeared that the first thing to do was to substantially expand the background store capacity and restricted operating memory of the central unit. The enterprises operating the AUTER systems and the Telecommunications Research Institute serving as patron for the system completely agreed with this. The OMFB also agreed with and supported the efforts aimed at the expansions, bringing the KFKI into the work. There, in the meantime, they had started development and manufacture of a central unit with increased capacity designated the TPA-1148. The experts of the KFKI found a way to transform the TPA-1140 computer into a TPA-1148 virtually under way with very short duration periodic suspension of continual operation. This involved--in addition to changing the CPU--primarily a substantial increase in the capacity of the operational memory and building in cache memory and large capacity Winchester type magnetic disk stores. In general they expanded operational memories by 1 M bytes, but further expansion is possible. Two magnetic disk stores with a capacity of 160 M bytes each were built into our systems while retaining the smaller capacity magnetic disk stores already operating.

As a result of the expansions described the operating system of the TPA-1148 based configurations had to be changed too. Today the configurations run under the RSX 11M PLUS operating system which is capable of handling all peripherals and terminals simultaneously, including the on-line BENSON plotter (DRUM-PLOTTER) configured into the system. Simultaneous with the creation of the TPA-1148 the number of display terminals was increased to six.

As a result of the expansions and remodeling the performance of the computer aided AUTER designing system increased substantially. The capacity of the databases which could be installed in the system increased, the possibility of simultaneous access from several terminals improved, the time for the machine run of individual tasks decreased to a tangible degree and the size and extent of the tasks which could be designed or processed by the machine increased.

The security of task solution became substantially more favorable because continual access to the background stores became easier so the tasks or subtasks can be stored more easily during the work processes.

2. Further Development of the Software Systems of the AUTER System Based on the TPA-1148 Configuration; General Overview

The hardware further development described in the preceding section and the RSX 11M PLUS operating system belonging to it necessarily affected the applications programs as well. The new operating system made it possible to exploit the possibilities hiding in the expanded hardware configuration. The favorable effects appeared primarily in the larger internal memory capacity and in achieving shorter running times.

We were able to realize the reworking of the applications programs only in two stages because building in the floating point processor necessary for the final changes happened as our article was being written.

In the first phase of the development we built the existing FIS-EIS hardware functions and the calls for the new system directives into the applications programs. At the same time, in the interest of achieving faster running, we had to rework the structure of the most commonly used FILM3 program; we did this by building in new program services and new instructions, because a real need for this was raised by the development of our technological and documentation systems.

In the second step of the development--taking place now because of the delay in the hardware expansion--we reworked the programs used into the FORTRAN-77 program language. This and the floating point hardware element result in a further decrease in running times. The possibility of placing data and instructions in separate memory areas is especially favorable from the viewpoint of the size of the programs which can be run, because in this way the size of the programs which can be run about doubles. Exploiting this is necessary primarily in the case of simulation programs and use of the KONSTR-M program and this is where the advantages of increasing the size appear.

The new hardware, the operating system going with it and reworking into the FORTRAN-77 language meant only an expansion of the attributes of the AUTER system and an increase in the speed of program running. But at the same time, within the framework of subprogram 2 of the OKKFT [National Medium-Range Research and Development Plan] A-6 national development program, there was a real further development of the AUTER systems during the Sixth 5-Year Plan in the areas of hardware and software alike.

In the following part of our article we will describe in more detail those further development projects the guiding and introducing of which fell in the sphere of the BHG Developmental Institute.

The three large electronics enterprises having complete AUTER systems (the EMG, Terta [the Telephone Factory] and the BHG) signed a research and development contract with the OMFB for the joint financing and development of software projects which could be used jointly. To perform this work our enterprises signed bilateral contracts with outside research institutes, software development institutions and undertakings.

Terta--as the party responsible for the theme--directed further development of the KONSTR-M designing program system and participated in the development of additional simulation programs. The KONSTR-M program package was expanded with a number of valuable modules among which the most significant are the following:

--a selective data correction, printing and interference checking module,
--a module performing 45 degree bus wiring,
--a module realizing multilayer wiring for inner layer power supply wiring distributed by computer design,
--listing of wires left out,
--wiring design on fine (distributed) grid networks avoiding intersections.

The most significant software development worked out under the theme leadership of the EMG makes it possible to design equipment oriented circuits (BOAK's) on the AUTER system.

We undertook to guide the development of two themes on behalf of the BHG. Their titles were:

--"Development of a uniform integrated database for AUTER programs" and
--"Integration of color raster graphics designing work stations in AUTER systems."

Within the framework of the next section we will deal briefly with the uniform integrated database. We will discuss problems of the graphics designing work stations in a separate section.

3. A Uniform Integrated Database for AUTER Programs

Development of the database and installing it into the system were made possible only by the Winchester type magnetic disk stores offering large background storage capacity in the TPA-1148 configuration and were justified by the following requirements.

3.1. The original AUTER programs used databases with different structures and contents despite the fact that in themselves the parts to be designed and mounted on printed circuit boards presented a uniform homogeneous collection of data. So our goal was to put the parts into a database with a uniform input method at only one place for the designing--and if possible technological--programs and to maintain them there.

3.2. In a single data input operation for one part it should be possible to feed in the geometric, mechanical, electrical, technological and other data and parameters in an order and system determined by the program so that the applications programs could then handle them as their own input data after suitable internal selection and transformations according to strict rules.

3.3. The database should also contain various groups of parts and designing rules for types which, linked to the part called, would go from here into the computerized designing process and aid problem-free manufacture of the printed circuit.

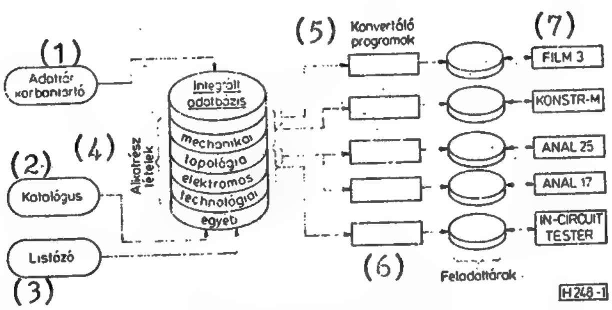
3.4. The database should provide circuit and wiring design experts with catalog type services the use of which makes it possible to query individual items and the grouped data for them. This same service makes it possible to ask for and list substitute types which, going beyond designing, could offer significant aid for the preparation of manufacture.

3.5. The database should make possible the storage of commercial data (e.g., manufacturing firms, acquisition sources, domestic and import prices, etc.), calling them up as needed. This service is especially useful if we connect the central computer of the AUTER system into an enterprise computerized information network which would significantly broaden the possibility of access.

Our enterprise signed a research and development contract with the Telecommunications Research Institute (TKI) to develop the uniform integrated database. Developing exemplary working contact with future users the experts of the TKI successfully solved this task, certainly not a simple one. The database was prepared and installed in our systems, but this did not mean the finalization of the program packages of the database because its structure is such that new "compartments" can be opened in the database as expansion needs arise. Such expansion possibilities will be required by the developed testing system and in-circuit testers to be installed at our enterprises as new special parts descriptions and parameters will be needed for the programs operating these.

Figure 1 illustrates the uniform database, its chief functions and its connection with the programs used. On the right side of the figure we have shown the AUTER program packages which will get the input data needed to run the individual tasks from their own task stores (previously only these were used) which will be loaded from the integrated database with the aid of conversion programs.

Figure 1. The AUTER Programs



1. ábra. AUTER programok

Key:

1. Database maintenance
2. Catalog
3. Listing
4. Integrated database
   Parts items:
   mechanical
   topological
   electrical
   technological
   other
5. Conversion programs
6. Task stores
7. FILM3
   KONSTR-M
   ANAL 25
   ANAL 17
   IN-CIRCUIT TESTER
   (the AUTER program packages)

So by task store we are to understand a file of computed data converted into a form suiting some given AUTER program. These could be, for example, parts data, PCB layout data, wiring data, frame data, etc.

The conversion programs call the data needed for the user programs from the data stored in a uniform system in the integrated database with the aid of appropriate identifying codes, transform them and load them into the task stores. The conversion programs are themselves parts of the program package for the integrated database.

The brief designations of the AUTER programs shown in Figure 1 are:

--FILM3: a program package processing manually designed PCB's (with digitizing input);
--KONSTR-M: an interactive program designing the PCB layout from the circuit diagram;
--ANAL-25: an analog simulation program;
--ANAL-17: a logic simulation program;
--IN-CIRCUIT TESTER: stands for the sum of the programs needed to connect future automatic testing devices (at present this function does not yet exist).

4. Graphic Interactive Designing Terminals, The Hardware

As we already mentioned almost simultaneous with putting the AUTER systems into use a need and possibility arose for supplementing them with graphic designing terminals. Practical realization of the theoretical possibility, however, ran into a number of obstacles. For foreign exchange and other external reasons we could not even think of acquiring the TEKTRONIX display terminals which would make high level interactive graphics work possible, although this would have represented the most economical solution.

The idea arose of integrating the vector graphics GD '80 configuration, developed by the MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences], into the system. An experiment to do this took place at one enterprise but it did not give a full value solution because the program systems of the GD '80 itself did not fit into those of the AUTER system. As a consequence it was not possible to develop the mutual, combined work of the two systems at a high level. Among the factors preventing the spread of the GD '80 configurations we might also list the high price of the system, the serious delay between developing it and getting it into production, the relative complexity of handling it and a rather large area occupation requirement.

In the period of seeking a suitable solution the Instrument and Measurement Technology Faculty (MMT) of the Budapest Technical University, on a commission from and in cooperation with the Electronics Factory of MEDICOR, began development of a raster graphics designing system, using as its central unit the MOD 81 data collecting system manufactured by MEDICOR. The display device of the system was a color TV receiver driven at RGB inputs and the operating unit was an alphanumeric display terminal made by VIDEOTON. The original goal of the development was creation of a graphics designing system which could be used in the "stand alone" mode, but at the beginning of the developmental work we indicated our need to use this system as an interactive terminal connected to the TPA-1148 configuration. This requirement also made it possible to use existing elements of the TPA configuration to produce documentation of tasks prepared on the MOD 81-MMT/RD configuration.

We wanted to use this configuration, which in the meantime became known as MOD 81-MMT/RD, for the already operating AUTER systems but because of an unexpected prolongation of the developmental work we were forced to look for other possibilities as well. At that time, unfortunately, the development of other domestically developed graphics work stations--since then completed--was only in the initial phases (e.g., the VT-32), and not even development of the PROPER 16 W configurations was finished. But it was obvious that even before manufacture of the PROPER 16 W began one could begin intensive program development and adaptation work and some phases could be completed since IBM PC XT computers were already available in a number of places for this work, and the PROPER 16 W is completely compatible with the XT.

In this situation the three enterprises were forced along different paths as a result of momentary external and internal circumstances. The EMG purchased an IBM PC XT, the Telephone Factory purchased a domestic configuration compatible with it and the BHG, after some hesitation, held out for the MOD 81-MMT/RD configuration which promised to be more useful.

The time elapsed since testing a prototype and putting a purchased twin into operation proved the correctness of the latter choice. More than ten systems put into operation in various areas of the electronics industry already prove the utility of the MOD 81-MMT/RD configuration. The majority of these systems work in the "stand alone" mode without a higher level computer environment and serve to design printed wiring on the screen.

The Mod 81-MMT/RD configuration has the following hardware system elements:

--a MOD 81 central unit (based on the Z80 processor),
--twin floppy disk stores,
--alphanumeric display with keyboard,
--matrix line printer,
--a graphics display (color TV receiver or monitor plus 1 M byte screen memory),
--a digitizing table.

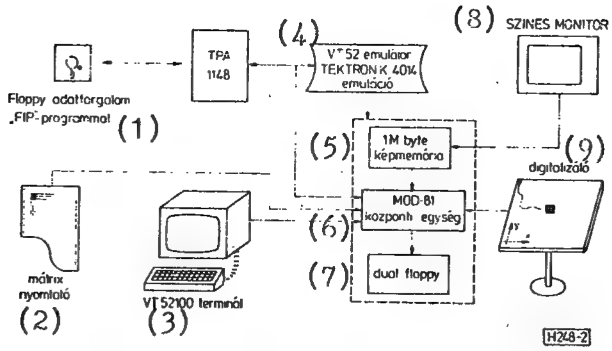
The system can also be expanded with an X-Y plotter or other plotter.

The hardware of the MOD 81-MMT/RD is based on standard EUROPA cards using LSI, MSI and SSI catalog circuits. A processor-independent standard bus connects the cards together. By using special coupling cards the single processor system can be expanded into a multiprocessor system.

Figure 2 shows the hardware system diagram of the MOD 81-MMT/RD and its connection to a TPA-1148 computer.

The earlier high degree of hardware and software compatibility of AUTER systems has unfortunately ended as a result of the enterprises purchasing different graphics terminals.

Figure 2. Block Diagram of the MOD 81-MMT/RD Hardware



Key:

1. Floppy data traffic with "FIP" program
2. Matrix printer
3. VT52100 terminal
4. VT52 emulator, TEKTRONIK 4014 emulation
5. 1 M byte picture memory
6. MOD 81 central unit
7. Dual floppy
8. Color monitor
9. Digitizer

5. Graphic Interactive Designing Terminals, The Software

At the MOD 81-MMT/RD work station the following programs aid graphic PCB design, correction or documentation:

--TERV: An interactive designing and correction program,
--AUTERV: An interactive circuit correction program written in the EKL language,
--DIG: A digitizing program with interactive correction mode,
--AED: Database editor program,
--DOKU: A program to prepare unit lists, test drawings and blackline prints,
--AUDOKU: A program to rewrite design results into the EKL language,
--MENT: A program to save picture memory, it has a role in case of power failure,
--MASOL: A program for fast picture memory save and load.

Contact between the AUTER applications programs and the MOD 81-MMT/RD work station can be maintained with the EKL (Egyseges Konstrukcios Leiras [Uniform Design Description]) description language. The TKI developed this software interface for the off-line mode.

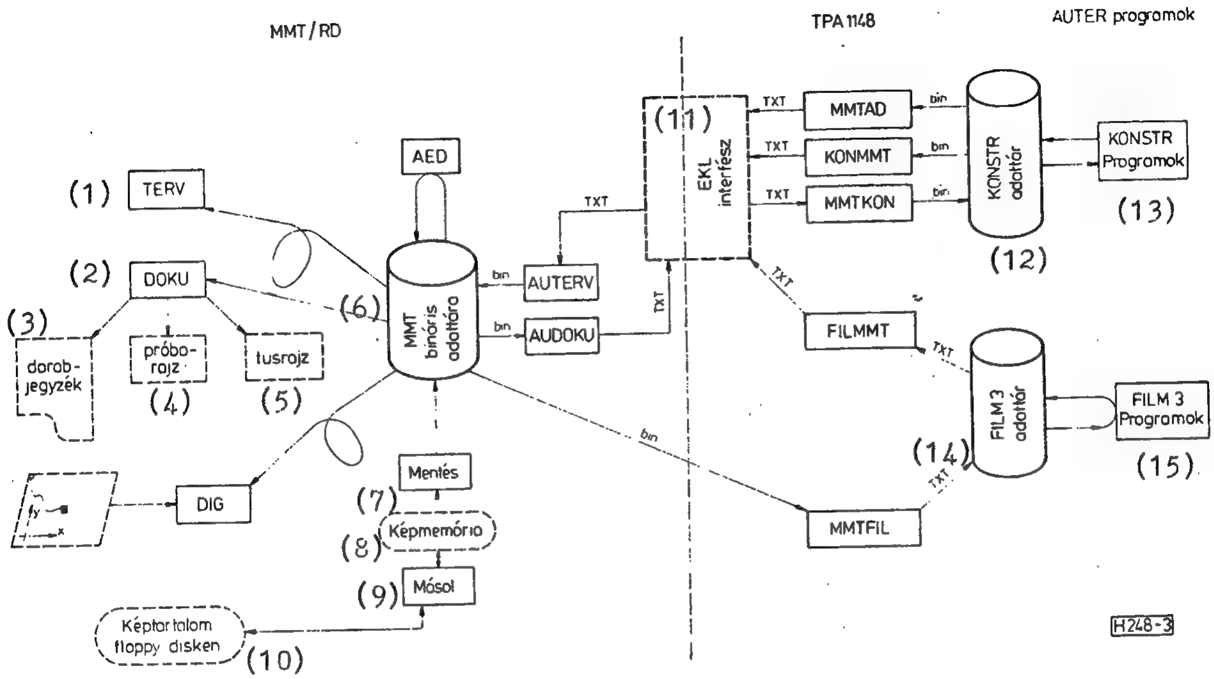
The following programs are also connected to these:

--MMTAD: A program copying from the KONSTR database to the MMT database,
--KONMMT: A program translating the KONSTR description into the EKL language,
--MMTKON: A program writing the EKL description back into the KONSTR database,
--FILMMT: A program translating the FILM3 program into the EKL language; it was developed by the AUTER department of the BHG; the FILMMT program breaks the FILM3 description down into two parts--a part which can be corrected on the MOD 81-MMT/RD, in which one finds 80 percent of the task description, and a part which can be corrected with a TPA text editor, in which one finds the screen text and the arc elements,

--MMTFIL: This produces the FILM3 description from the binary data of the MOD 81-MMT/RD.

Figure 3 illustrates the functional connections of the programs.

Figure 3. Functional Connections of the Programs



Key:

1. TERV
2. DOKU
3. Unit lists
4. Test drawing
5. Blackline print
6. MMT binary database
7. Save
8. Picture memory
9. Copy
10. Picture contents on floppy disk
11. EKL interface
12. KONSTR database
13. KONSTR programs
14. FILM3 database
15. FILM3 programs

6. Our Experiences In Using Computer Aided Design and Our Plans for Further Development

Putting the AUTER system into operation must be evaluated positively, because it has been proven already that introducing computerized methods was indispensable in this area of the electronics industry also. With its aid we can provide substantially better documentation and can significantly reduce throughput time.

Increasing the fineness of drawings and introducing multilayer PCB techniques requires larger capacity designing programs satisfying ever more complex designing rules. Our designing systems have lagged behind the development of

technology, so one can understand the large number of tasks which exceed computerized designing, having manual designing and computerized documentation.

The appearance of the computer also raised a number of new problems. Some shy away from it, partly because this technique demands extra work from them (e.g., preparing a connections drawing which can be digitized and filling out the necessary data sheets, or preparing demanding, enlarged layout drawings). This extra work could be ended with an easily managed graphic designing work station which did not require special computer technology knowledge.

The reception of the final results of computerized designing jobs also meant many problems. For example it is enough to mention that the line printer item lists are not accepted in the existing enterprise documentation system.

Increased efforts had to made to standardize mechanical designs and to take into consideration the parameters of numerically controlled manufacturing tools. An informative link between the PCB designing system and the computerized tools aiding the mechanical designers proved to be lacking in this area.

The new requirements which can be expected to be posed by the development of manufacture and testing technology can be summarized in the following points:

1. Providing manufacturing tools for manufacture of fine PCB's;
2. Providing information to equipment testing PCB's via data carriers;
3. Supplying assembly equipment with control information needed for their operation;
4. Providing the information needed to prepare for manufacture.

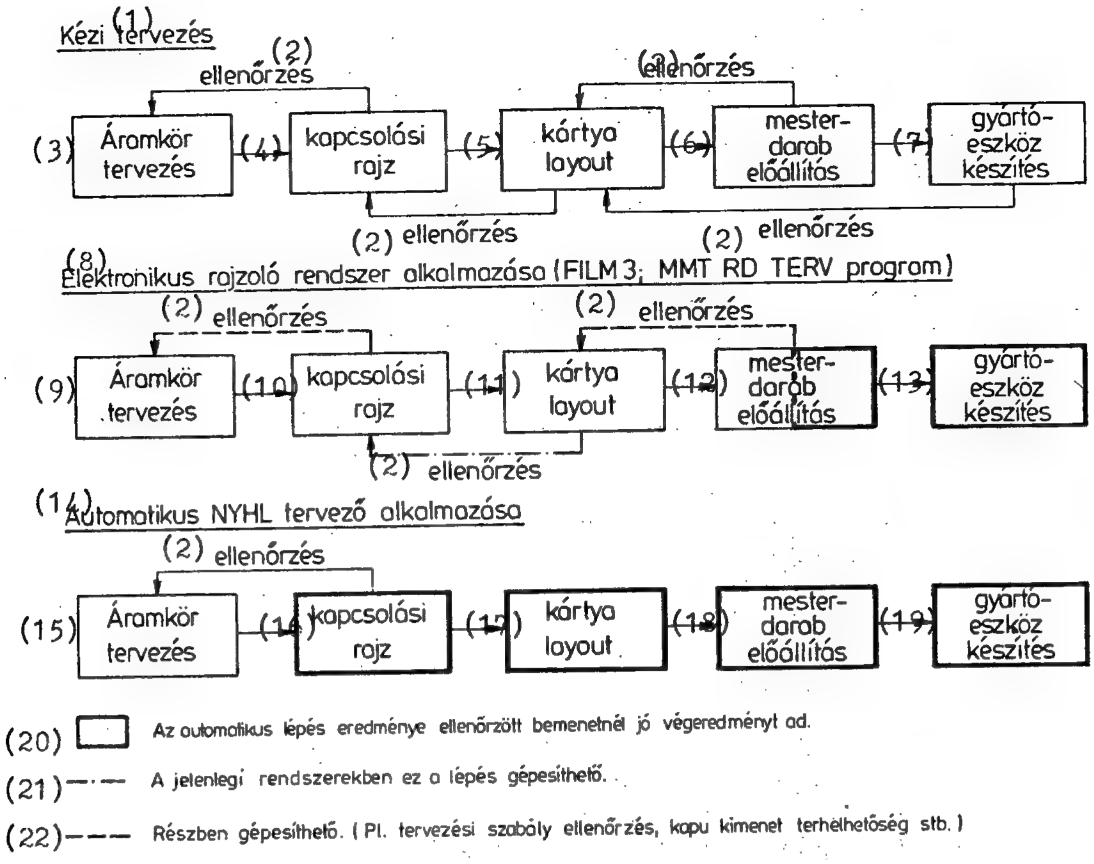
Before describing our developmental ideas let us look at what main steps the coexisting PCB designing and manufacturing procedures contain and where these might be aided by computerized methods.

Figure 4 illustrates in large steps those functions which must be gone through during PCB designing in order to produce the manufacturing tools. (We mean to include documentation preparation in the box labled "preparation of manufacturing tools".)

Completely manual designing methods will still be present for the next 1-2 years because of the widespread auxiliary tools (scratching machines, gluing tables) and because of their independence from central designing offices.

Our developmental plans include creation of individual designing stations which we will equip with a MOD 81-MMT/RD level graphics terminal. We must solve computerized checking between designing steps at such preparatory graphics work stations too. At special sites we must install computers in the IBM PC XT category. Medium power programs with automatic functions can be installed on these (and they may be suitable for circuit simulation as well). Most such systems will use a mix of automatic or interactive graphics manual methods with automatic checking functions.

Figure 4. Printed Circuit Board Designing Functions



Key:

1. Manual designing
2. Checking
3. Circuit design
4. Circuit diagram
5. Board layout
6. Producing master
7. Preparation of manufacturing tools
8. Using an electronic drawing system (FILM3; MMT RD TERV program)
9. Circuit design
10. Circuit diagram
11. Board layout
12. Producing master
13. Preparation of manufacturing tools
14. Using automatic PCB design
15. Circuit design
16. Circuit diagram
17. Board layout
18. Producing master
19. Preparation of manufacturing tools
20. The result of an automatic step at checked input gives good final result
21. This step could be mechanized in present systems
22. Could be partially mechanized (e.g., design rule check, gate output loadability, etc.)

We should note that there are such automatic checking components in the AUTER TPA 1148 system (circuit diagram editing SGI, design rule checking TSzELL, Plotter control tape checking PIDO, etc.) but only some of these are in use.

By far the greater number of tasks could be prepared at the work stations mentioned above but there will be tasks which, because of their size or special nature, can be solved efficiently only on more knowledgable equipment by specially trained experts.

During further development special attention must be turned to the hardware and software components to be selected. An automatic information transmission process must be provided for certain manufacturing operations (assembly, testing, etc.). In making the selection care must be taken that we will be able to perfectly meet the earlier described requirements system and the new requirements deriving from the expected development of manufacturing technology.

Such a new need is satisfying the requirements for surface mounting PCB design and the related assembly technology.

In the interest of uniform information transmission there must be a coordination of the installation of the independent designing systems to be created along side the central AUTER system. A system of links between the integrated database and the local databases must be solved for the new tools as well. In sum we can say that we will be able to successfully further develop the PCB designing system of the BHG only if we broaden the circle of tools and of colleagues able to accept them.

Biographic Notes

Sandor Radai obtained his honors mechanical engineering degree at the Budapest Technical University in 1956. He has worked at the BHG since 1958, always in technological development areas. From 1970 he was chief of a technological development department and since 1978 has been chief of a design development department and has been a leading member of the BHG Developmental Institute since it was founded. He is a professional expert in a number of technological areas.

Gyorgy Mihalyi obtained his electrical engineering degree at the Electronics Technology Department of the Electrical Engineering School of the Budapest Technical University in 1979. Since then he has worked in the BHG Developmental Institute, initially in the Technological Designing Department and since 1980, since it was formed, in the AUTER Department. He has been chief of the AUTER Department since 1982. In 1982 he obtained a special engineering degree in the Computerized Circuit Design and Manufacture Department of the Electrical Engineering School of the Budapest Technical University.

8984
CSO: 2502/59

ROMANIA: COMPUTERS IN AUTOMATION, ROBOTIZATION

Bucharest REVISTA ECONOMICA in Romanian No 52, 26 Dec 87 pp 12-14

[Excerpt from article by Dr Adrian Davidoviciu, Scientific Research and Technological Engineering Institute for Computer Technology and Data Processing: "Computer Technology and Data Processing, Underpinning of Automation, Robotization, and New Technologies"]

[Text] Ongoing Quantitative and Qualitative Development

In Romania, a country which has made the firm decision to build a modern economy within a relatively short period, the main party and government program documents contain a number of explicit provisions regarding the decisive role to be played by scientific research, technological development, and introduction of technical progress in the current stage and in future development of Romanian society. The unified national plan for the 1986-1990 period, the annual plans, and priority programs implement this policy. The special importance assigned to vigorous development of the scientific and technological basis of all sectors of activity has contributed to the good results obtained during the year just ended and creates the most favorable preconditions for the entire 5-year plan and over the long term. As was pointed out by the party secretary general, Comrade Nicolae Ceausescu, at the recent plenum of the RCP Central Committee, "Not for a moment must we forget that we can reach the objectives of our development only on the basis of the latest achievements of science and technology in all areas of activity. Commitment of all forces to the new technical and scientific revolution and the new agrarian revolution represents an objective necessity for implementation of the party program and for ensuring elevation of our country to a high level of economic and social development."

Computer technology and data processing occupy a priority position in this context, inasmuch as they are organically involved in implementation of the programs for electronization, automation, and robotization, for organization and modernization of production processes. Over the last 2 decades that have passed since the inception of this sector of industry in Romania, a favorable framework has been created for activities in the area of computers and data processing. Conditions favor ongoing development, constantly coordinated with the needs and capabilities of the Romanian national economy in each stage and the trends of development of Romanian science and technology and related to the revolutionary process taking place in science and technology throughout the world.

Applying the basic principle of conducting research and starting up production of high-performance equipment in Romania, with both horizontal and vertical integration, the Romanian computer industry currently produces a wide variety of computer systems of varying capacity (see sidebar).

The share of computer production based on original research rose from 47 percent during the 1976-1980 5-year plan to approximately 90 percent during the 1981-1985 5-year plan.

Romanian equipment in the minicomputer and microcomputer class performs well, is competitive internationally, and is rated very highly by users. This has led to significant increase in the demand for such computer equipment. For example, in 1986 firm orders for minicomputers by users in the economy were 4 to 5 times greater than the supply available from manufacturers, and 3 to 4 times greater for microcomputers. This demand for computer equipment also reflects the objective requirements of enterprises resulting from application of programs for scientific organization and modernization of production processes. This "state of mind" of the Romanian economy is encouraging; it expresses understanding of the need for such modern instruments and creates the obligation of ensuring the fastest possible growth of the output of such equipment, along with increase in export marketing of the equipment.

Current and Long-Term Priorities

The rapid development of the Romanian computer and data processing industry, based almost exclusively on domestic potential and efforts, creates new prospects for substantial new progress in this area.

The concerns deriving from current needs include the following:

-- acceleration of research to develop and produce a family of 32-bit superminicomputers and to start production of the professional computer (FELIX-PC);

-- concentration in personal computer production on types, such as the HC-85 and TIM-S, which are compatible with models which are commonly used throughout the world;

-- adoption and manufacture of a system of industrial microcomputers of flexible structure and conforming to an international standard (MULTIBUS II, VME, etc), this system to be based on a family of standardized functional modules using 8/16/32-bit microprocessors and a connecting bus for different industrial uses (process management, robotics, electronization of technological equipment, etc);

-- involvement of research resources in the area of physics and precision mechanics in solution of the problems associated with ongoing development of peripherals necessary for efficient use of computer equipment;

-- intensification of work, on the basis of close cooperation and integration with higher education, toward long-term research objectives, such as peripherals based on laser technology and optoelectronic recording, highly reliable computers (for industrial applications), artificial intelligence

reliable computers (for industrial applications), artificial intelligence (expert systems, artificial vision, advanced robotics), distributed processing computer systems, computer networks (local and general), etc, which are of particular importance in assuring future development of the Romanian computer and data processing industry.

The area of software products is structured as an industrial sector, both for domestic needs and for export. For the first time, a software industry is to be established during the current 5-year plan. The industry is to be characterized by a high degree of utilization of the competence and professionalism in this area, to be reflected in substantial improvement in product quality and labor productivity in development work. The first steps have been taken this year to establish the prices at which software products are to be marketed as independent commodities in the economy.

In the area of data processing applications, the experience acquired especially over the last 2 to 3 years creates greater confidence in continuing the transition from simple applications to systems applications making better use of the advantages offered by modern computers, primarily in areas of high economic efficiency such as applications for supervising and controlling equipment and technological processes, computer aided design and engineering, efficient production management, quality control and monitoring, etc. The share of dedicated "turnkey" data processing systems will increase in this process. These systems will offer customers rapid and efficient solutions for a wide range of standardized applications.

The intensification of standardization activities in the area of computer software development will lead to increase in the potential versatility of software products and to higher performance. Customers will be able to take tested and approved software programs from the National Software Library and implement it without significant modifications .

One final point on which the attention of producers and users of computer equipment and data processing applications and of educational institutions must be concentrated derives from Comrade Nicolae Ceausescu's suggestion regarding elevation of the level of professional training and reassignment and retraining of workers and all cadres. "All the objectives of development, achieving new quality, and raising the technical level of products can be reached only with personnel with high professional, technical, and scientific training." This thorough training of persons who conduct research on, design, produce, and operate computers and software, and of the users of this hardware and software, is a decisive requirement for ensuring success and efficiency of data processing applications in the Romanian national economy.

[sidebar, p 13]

Accomplishments of the Romanian Computer Hardware Industry

On the basis of its own research, the Romanian computer hardware industry produces an increasingly varied assortment of equipment which is used both for data processing applications proper, in computer aided design, and by being incorporated in technological systems, to which it imparts high performance from the viewpoint of productivity, dependability, and accuracy.

The most recent accomplishments, which also represent an important area of export supply (some products also are or can be incorporated in integrated products) include the following;

The FELIX-5000 computer embodying updated technology;

Minicomputers (the CORAL family, with models 4001/4021/4015, and the INDEPENDENT family, with models I-102F and I-106, both of which are competitive on the world market and are compatible with the de facto standards imposed by the leading international manufacturer, DEC in the United States);

Microcomputers (FELIX-M 18/118, CUB/CUBZ, TPD Junior, MS-100, etc);

Data collection and input systems, data concentrators (CD-80), electronic invoicing and accounting equipment (FC-1000).

The field of personal computers (aMIC, PRAE, HC-85, TIM-S) has also been entered recently.

The peripheral equipment produced includes especially medium-capacity hard disk drives (40-50 megabytes) of a quality rated highly by users, serial and parallel printers, magnetic tape units, alphanumeric and graphic terminals, floppy disk drives, modems, and more recently a drum plotter and digitizer.

6115
CSO: 2702/8

TRIUMPHS, VICISSITUDES OF HUNGARIAN MACHINE INDUSTRY AUTOMATION

Budapest GEP in Hungarian No 3, Mar 87 pp 89-91

[Article by Dr Jozsef Hatvany, of the Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences, and Dr Matyas Horvath, of the Machine Manufacturing Faculty of the Budapest Technical University: "Peaks and Valleys of Technology--Navigation Problems in the Hungarian Machine Industry." The first paragraph is the Hungarian summary.]

[Text] The authors show with examples the outstanding achievements of domestic machine industry research and development in the areas of machine tool development and computer integrated manufacture. They analyze the causes due to which intellectual achievements generally do not become real business successes. They formulate recommendations in the interest of better utilization of results and an acceleration of innovation processes.

Our country has given enough scientists to the world to be considered a scientific great power. In addition to the cultivators of mathematics, physics, cybernetics, economics and medical science our great technical men who have gone abroad have enhanced the reputation of our country and proven the creativity of this small people. Even today the successes of our agriculture and our social and economic experimenting spirit are winning the recognition of the world for Hungarians here at home as well. But our economic development--in the general judgment--is not in harmony with the cultural and intellectual level of our people. The basic reason for this is that our industry, and our machine industry therein, which determined the world level at the beginning of the century in many areas--milling industry machines, electric motors, light sources, water machinery, railroad vehicles--runs today in a gray middle field and must even struggle hard not to fall farther behind the front runners who dictate a dizzy pace.

Our machine industry is in a difficult position in an age of international integration, specialization and cooperation, of total automation and a quality revolution based on microelectronics and computer technology. Can it contribute to the advance of the technological revolution today, when the capital intensity of research and technological development has increased to an unheard of degree, when it suffers alike from economic discrimination, the embargo, a lack of capital and obstacles to and confusion in cooperation? Will it be its fate to follow development from a respectable distance and adopt

cheap, simple solutions a decade late? Are there today any domestic achievements of which we can be justly proud? What are we doing and what can we do still to narrow the technological gap in the machine industry?

The Peaks

The most modern equipment, tools, procedures and systems for machine industry automation belong in the sphere of peak technologies and as such they are generally embargoed. For this reason also we have had to fight our own way to a few outstanding technological peaks. At the beginning of the 1970's our machine tool industry completely transformed its product structure and today manufactures almost exclusively numerically controlled machine tools and flexible manufacturing cells and systems. In 1973 they introduced the DNC'73 group machine tool control which at that time was the best in the world in concept, function and architecture. The DIALOG CNC was the world's first interactive control, making possible a real dialog between operator and machine and convenient editing and correction of the control program and opening a new path in the development of man-machine links. The first flexible manufacturing systems of the CsMSzG [Csepel Works Machine Tool Factory] and the SzIM [Machine Tool Industry Works] were competitive in terms of integration with their most famous contemporaries. The lathes and processing centers, rejecting anthropocentric structure, serving automation ideally and having a new morphological structure, realize the most modern principles.

The extraordinarily compact MC-403 manufacturing cell unites the flexibility of CNC with high productivity. The development of an ensemble consisting of a multi-axis processing center, the UNIMERIC 755 control, a UNIPROG work station which also carries out DNC functions and a designing system to describe complex surfaces and plan the working of them proves that we are capable of producing even complex technological systems which are the object of the most strict embargo.

The domestic tools for geometric modeling and computer graphics, the GD'71 and GD'80, the MODBUILD FFS, FAUN, etc., take the place, if at the price of great difficulties, of similar systems also banned. The devices developed for form and position recognition and domestic methods for automated diagnostics and quality control have made it possible to increase the intelligence of robots and bring unsupervised manufacture realistically closer. Especially outstanding are the results of and systems for computer aided engineering design which are capable of aiding the work of a technologist, from high level logical decisions to tool movement, that is from the design of manufacturing sequences and operations to the working of complex surfaces.

A characteristic Hungarian school has developed which combines the geometric graphics and systems technology achievements of the developed capitalist countries with the valuable technological traditions of the socialist countries and develops them further. The vario-generative designing principle, the use of the PROLOG language, that is of the method of expert systems, and the development of hybrid systems are characteristically Hungarian achievements. The device designing system based on the MPROLOG language, a Hungarian development, a system which is unique even internationally, can be considered significant; it builds pallet traveling devices out of

prefabricated elements for manufacturing systems, solving one of the most burning problems of flexible automated manufacture. And finally, the SATT system developed for computer aided design of flexible manufacturing systems and the developmental philosophy behind it prove that scientific workshops, schools and development bases for the chief trends comprehensively characterizing and determining the development of the machine industry can and do function even under the modest, indeed disadvantageous, domestic conditions, that they are keeping up with the dizzy speed of progress; they are recognized even by international professional-scientific public opinion and a few leaders of them are recorded as members of the restricted club of the world's most outstanding.

The Hills

Unfortunately the scientific results of machine industry automation achieved in domestic research and development have not been accompanied and are not accompanied today by business successes which have the power of a breakthrough. A number of original ideas and innovations have been born here, but the industrial scale manufacture was realized more quickly by large foreign enterprises which took over the ideas and which are faster in innovation. Thus it was with conversational mode CNC control and thus it is now with the heterarchic manufacturing system control subsystem. So we are not conquering the peaks even in those areas where the necessary intellectual performance is not missing and where the product structure was transformed in time and in the name of modernity.

All our technical and economic problems are strikingly condensed in those branches of the machine industry manufacturing tools of production, that is manufacturing peak products. Partly for political reasons and partly due to our own bungling and our internal problems, this branch is shut out of the harmonic integration and cooperation processes of the industry of the world which are nourished by a division of labor and specialization which have become total and taken on a world scale. Due to the embargo, the shortage of foreign exchange and of capital in general and the high import prices the driving branches of the machine industry get the necessary building elements and background industry products late, with difficulty and expensively.

At our enterprises one can find only traces of the engineering use of computer technology--perhaps the most important tool for swift and flexible development and a short throughput time. One can hardly find equipment for high precision manufacture or modern testing techniques, and so we struggle with quality problems. Lacking capital the enterprises manufacturing tools for flexible automation hardly use this technology although they know that today this is the most important condition for survival, in life and on the market. And finally, the circumstance that we have not learned even yet to manage wisely with our intellectual capital, that we do not respect the outstanding researchers, developers, designers and technologists, also leads to smoothing out into soft hills in the phase of realization the new achievements which promised to be peaks.

The Valleys

Just as the leading enterprises manufacturing modern products drive our industry forward so the branches trailing behind act as a brake on development, branches which are not capable of satisfying the quantitative and especially the qualitative demands of peak technology. They are late with structural replacement, technological modernization and development of a productive infrastructure and are forced to make do on obsolete equipment. The most important condition for our development, for the development of the driving branches, is for those lagging to catch up, to transform the product and production structure and modernize technology, by mobilizing working capital.

Together To The Peaks

We have no other possibility but to climb the peaks, mobilize the intellectual accomplishments, technological development, and increase the quality level, degree of processing and intellectual value component of products. The stormy transformation of the world economy and the oil crisis prove that it is not ample raw material but rather technological development and intellectual performance which can provide a foundation for the lasting flourishing of economy and society. This is especially true of our little country, which is poor in raw materials, the only treasure of which, in addition to good productive land and climate, is the creativity of our people.

Scientific research must lay the foundations for the peaks, for improving our ability to participate in international exchange, for raising the value of Hungarian work on the world market. The domestic research network--the Academy and industry research institutes, the universities and enterprise laboratories--is doing its duty in the area of machine industry automation as well. The results prove that one can create here also, if under more difficult conditions. The government is helping, organizing and materially supporting scientific work being done in the chief directions of stressed significance. Large central programs have accelerated the development and industrial use of NC technology and flexible manufacturing systems, the development of machine tools made with a new morphology and the development of multi-axis processing systems.

Today the National Scientific Research Fund encourages basic research and the national research and development program of the machine industry is accelerating development in the areas of flexible automation, robot technology, ultraprecise manufacture and mechatronics, computer aided design and education and is increasing the sphere and level of entrepreneurial spirit, product assortment and services. Domestic researchers are open in every direction. In a lamentable way the efficiency of their work is reduced by the unwillingness of the most developed countries to cooperate in the area of peak technologies, and by the embargo on the most modern tools--instruments, computers, designing systems and technologies. The social order of values, the interest relationships, troubles with cooperation and the scattering of intellectual capacity and of capital, which can still be

experienced, hold back effectiveness. The problems are known, there is a readiness for and a program for even greater openness, for accelerating the innovation process, and we trust that the problems can be averted.

We know in what direction the product and production structure must be transformed. We know that we must link into the integration process in the eastern and western direction alike.

We know that we must increase the intellectual value component of products, must create a software industry capable of export, the independent export of Hungarian know-how. We must exploit the extraordinary opportunities deriving from the complex scientific-technical development program of the CEMA countries and we must exploit the gigantic Soviet market, which increasingly needs peak technology in the interest of acceleration and realizing the ambitious machine industry development plans. Working capital is needed to expand production. We must create--and there is a hope that we will--the most liberal capital investment possibilities. If our compatriots living abroad make use of the opportunity and help turn to a profit the expertise and creativity of those living at home it will be profitable for everyone and will be good for our country too. With common strength let us conquer many high scientific-technical and economic peaks.

8984
CSO: 2502/56

POLAND: PRECISION MANIPULATORS FOR LASERS

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 12, Dec 86 pp 367-373

[Article by Dr Z. Mrugalski, L. Buczynski, W. Czerwiec, B. Deczkowski, J. Igielski, J. Mizielinski, A. Rastowicki, J. Rawski, J. Soltysinski and J. Zadara, Warsaw Technical University, Poland: "Precision Manipulators for Laser Technology." The first paragraph is the Hungarian language summary.]

[Text] All the manipulators described in the article are newly developed equipment not previously manufactured in Poland. They are used successfully in Warsaw at the S. Naliski Plasma Physics and Laser Microsynthesis Institute, for example for studies of plasma with high powered lasers. Additional equipment design and research work is being done at the Precision Engineering and Optics Institute of the Warsaw Technical University which will be used in laser technology. From the experience acquired in the course of manufacturing the equipment described we dare hypothesize that the new equipment also will satisfy the precision requirements made of it.

The development of scientific research work has created an opportunity to design and build ever newer and more unique equipment, thus enriching the technical base for the experiments to be done.

At the Precision Engineering and Optics Institute of the Warsaw Technical University we have developed a family of precision manipulators which can be used well in controlled laser synthesis experiments. The members of this family are the following:

--The AM 150 mirror holder for optical elements with a maximum diameter of 150 mm and the AM 330 model for a maximum diameter of 330 mm. Both units are capable of positioning optical elements with five degrees of freedom (three translation and two rotation);

--A transverse movement table to position test pieces--during processing with laser micro machine tools--with two degrees of freedom in the horizontal plane; and

--A universal drive unit (in several versions) which we use with the above mentioned equipment for both straight line and angular positioning purposes.

The strict requirements made of this equipment--in regard to precision of positioning and repeatability--demanded the development of very careful final working of the building elements used and a testing of various versions of the elements and structural units (e.g., bearings, guides, drives).

In what follows we describe the designs which can be regarded as final and the finished manipulators the series manufacture of which has already begun.

The AM 150 Self-Operating Manipulator (Mirror Holder) (references 2 and 5)
The structural solution of the manipulator makes possible the spatial orientation of optical elements with a diameter of 150 mm and thickness up to 30 mm. (Both transparent and reflecting optical elements can be moved in the following ranges: acccording to x and y right angle coordinates in the horizontal plane, z in the vertical direction and along alpha and beta angular coordinates. See Figure 1.)

The movement ranges desired for positioning the optical elements were the following:

"Macro" movements:
- --straight line (x, y, z): 0 to 20 mm with a maximal setting error of plus or minus 0.1 mm;
- --angular movement (alpha, beta): plus or minus 5 degrees with a maximal setting error of plus or minus one minute.

"Micro" movements:
- --straight line 0 to 0.2 mm with a maximal setting error of plus or minus 2 microns;
- --angular movement 0 to 5 minutes with a maximal setting error of plus or minus 5 seconds.

Such precise movement of large and heavy elements made necessary the solution of a number of complicated problems. Of these the most important was achieving very small friction when eliminating the play of bearings or guides.

Figure 2 is a photograph of the outside of the manipulator and Figure 3 shows the design of the structural unit which turns the optical element. The pins (2) are fitted into the ring (1) which is vertically supported by bearings; the inner ring (3) has a bearing support to the pins and the mirror (4) is fixed in the inner ring.

Thus the inner ring (3) can be turned in angle alpha relative to the horizontal plane. The drive unit (5) performs the angular turning of the two rings; the end pieces of the drive unit form a radius of r=100 mm on the rings (Figure 6). A clamp spring (6) ensures constant contact between the end piece and the ring. Fasteners (7) fix the mirror (4) into the inner ring; the fasteners are so designed that their useful surface (8) corresponds to the alpha or beta turning axis.

Guides supplied with rolling bearings provide for the x or y straight line movmement of the mirror (Figure 4). These guides are located in the

manipulator frame. In order to be able to ensure control of the transverse or longitudinal play of the guide we fixed several bearings to the excenter pin.

Vertical guides (Figure 5) and a load bearing spring (1) provide for mirror movement along the axis. In the course of planning the idea was that the strength of the spring could be set on the basis of the weight of the optical element or the structural unit moving along the z axis. A drive (2) takes care of vertical movement of this structural element; its end piece is supported on the manipulator frame.

Depending on the character of the optical elements to be placed in the container (being fitted in) the drive units providing alpha or beta movement are placed on one side (Figure 6 a) or both sides (Figure 6 b) of the manipulator.

If it is not necessary for the optical element to be positioned according to all five coordinates (x, y, z, alpha, beta) then the unnecessary movement can be eliminated and so the drive unit corresponding to it can be left out of the manipulator.

There are drive units (these will be described later) which are supplied with stepping motors so that they can be controlled by a control unit connected to a computer.

The AM 330 Automatic Manipulator (Mirror Holder) (reference 7)

Using the experiences acquired during development of the design for the AM 150 manipulator we created the AM 330 automatic manipulator. This performs spatial setting of optical elements with a diameter of 330 mm with the same precision as the AM 150 manipulator.

Figure 7 shows the manipulator. Like the AM 150 manipulator it consists of the following units: 1. a frame--in which one can find the mechanisms providing x and y linear movement; 3. a vertical movement mechanism; 4. the mirror holder, and the mechanism providing angular movement; and 5. a drive unit. The large mass of the several subassemblies and the entire manipulator made it necessary to seek design solutions different from those of the AM 150 manipulator. Thus, for example, the rings moving along angles alpha and beta received a new bearing suspension and the drive unit providing vertical movement was located inside the manipulator. As in the preceding cases, in the interest of providing x, y, z straight line movement, we used guides with rolling bearings. To drive the mirror holder we use a drive unit for every coordinate which is supplied with a stepping motor, as with the AM 150 manipulator.

The Electrically Driven Transverse Movement Table (reference 6)

This table makes possible positioning of a test piece in the horizontal plane (along axes x and y) with the aid of a drive unit (3) supplied with a stepping motor and provides for manual setting along the vertical axis and for turning around the axis (Figure 8). The equipment consists of two independent units (1 and 2) which provide straight line movement along the x and y axes respectively. A microswitch (5) limits the range of these movements; it can be

changed with adjustable stops. On the transverse moving table (6) it is possible to pick up flat test pieces with the aid of a vacuum; the vacuum guide is located under the table (7).

Vertical movement of the transverse table is done manually after loosening the lock (8). Independent of this the table can be moved by hand around the vertical axis. We designed a programmable control unit (Figure 9) to control the drive units of the table; it is connected to the stepping motors or microswitches of the table with special connecting lines. The table can also be controlled by intervention of a control unit from external equipment, e.g. from a computer. The basic data on the table, moving in the transverse direction, are the following:

--range of x, y straight line movement: 20 mm;
--range of z vertical movement: 8 mm;
--range of angular movement: 360 degrees;
--basic step of x, y movement: 20 plus or minus 1 microns;
--hysteresis error produced in entire movement range: max. 5 microns.

The electrically driven transverse table serves to fix and automatically position test pieces for a laser micro working machine. It can also be used for other purposes such as automatic measurement of optical or electronic elements using a computer.

A Constant or Variable Positioning Sensitive Drive Unit (references 3 and 4)

In the equipment described thus far we used a cabinet drive unit supplied with stepping motors to produce the straigt line or angular movement (Figure 10). The operating principle of this is that the turning movement of the motor axle is transfered to the linear bearing of the output pin. In accordance with the needs the stroke of the output pin can be constant (e.g., 2 to 20 microns depending on the shim used) or, using a differential screw, it can have two values, "Macro" and "Micro." This latter form of drive makes it possible for the system to be put quickly into the desired position and attitude within a given range. The "Macro" range is 20 mm with a basic step of 2 microns while the "Micro" range is 0.2 mm with a basic step of 1.5 microns.

Summary

All the manipulators described above are newly developed equipment not previously manufactured in Poland. They are used successfully in Warsaw at the S. Naliski Plasma Physics and Laser Microsynthesis Institute, for example in studies of nuclear plasma with high powered lasers (reference 1). At the Precision Engineering and Optics Institute of the Warsaw Technical University new equipment design and research work is being done which will be used in laser technology. In the wake of the experiences acquired in the course of manufacturing the equipment described above we hypothesize that the new equipment also will satisfy the precision requirements made of it.

(Translated with the authors' permission by Janos Turi and prepared for the press by Dr Antal Huba.)

BIBLIOGRAPHY

1. Technische Information von IFPiLM: Lasery wielkiej mocy (Hochleistungslaser); PRZEGLAD TECHNICZNY, No 4, 85, p 2.

2. Igielski, J.: An automatic manipulator for setting up laboratory optical systems.
Igielski, J.: Automatyczny manipulator do justowanin laboratoryjnych ukladow optycznych (Automatische Manipulator zum Justieren von Labor-Optiksystemen); POMIARY, AUTOMATYKA, KONTROLA, No 13, 83, pp 410-413.

3. Zadora, J.: Variable positioning sensitive microdrive.
Zadora, J.: Mikronaped o zmiennej czulosci pozycjowania (Mikroantrieb mit varibler Positionierungsempfindlichkeit); BIULETYN PIAP, No 5-6, 82, pp 95-97.

4. Zadora, J.: Patent application number P.238 831 (5/10/1982), "A System With A Differential Screw."

5. Czerwiec, W., Wierciak, A., Mizielinski, J., Rastawicki, A. and Buezynski, L.: Patent application number P.244 191 (18/10/1983), "Mirror Holder I."

6. Czerwiec, W., Wierciak, A. and Sotysinski, J.: Patent application number P.244 102 (18/10/1983), "A Roundtable Mechanism."

7. Mizielinski, J., Zadara, J., Mrugalski, Z., Rawski, J., Wierciak, A., Buezynski, L. and Igielski, J.: Patent application number P.244 811 (29/11/1983), "Mirror Holder II."

FIGURE CAPTIONS

1. p 367. Coordinates of the manipulator.
2. p 367. The AM 150 manipulator.
3. p 367. Schema of the unit turning the optical element.
4. p 371. Schema of the unit providing straight line movement.
5. p 371. Unit providing vertical control.
6. p 371. Ways of placing the drive units.
7. p 371. The AM 330 manipulator.
8. p 372. An electrically driven table moving in the transverse direction.
9. p 372. Transverse table and control equipment.
10. p 372. Drive unit supplied with stepping motor.

8984
CSO: 2502/54

HUNGARY: TABLE OF CONTENTS OF ELECTRONICS JOURNAL

Budapest MAGYAR ELEKTRONIKA in Hungarian No 2, 1987 p 2

[Text] NOTE.......... p 1

FOCUS.......... p 3

Friedrich Mikuska: BASIC Programming of PLC.......... p 9

COMPUTER TECHNOLOGY:

Ivan Futo: Knowledge Base Modeling on PROLOG Foundations.......... p 14
Peter Garami: A PROLOG Processor for Personal Computers.......... p 18
Jozsef Drasny: Computer Background for Hardware Development.......... p 22
Jozsef Szabo: Image Processing Systems and Their Applications.......... p 26

REVIEW:

Selection From New Foreign Books.......... p 38
New Domestic Books.......... p 39

PANORAMA: Huba Bruckner: Electronic Communication--VIDEOTEX.......... p 40

HOBBYTRONICS: Peter Hanak, Tibor Torzsai and Ferenc Alpek: Measurement Peripherals Interfaced with Commodore C-64.......... p 51

CIRCUITS:

Endre Simonyi: A Device to Accelerate IBM PC/XT Compatible Computers.......... p 55
A Simple RS-232C Driving-Receiving Circuit With Double Operation Amplifier.......... p 57

FURTHER TRAINING: Janos Mizsei: Transistors--Comparative Derivation of Characteristic Equations.......... p 58

INTERFACES:

Research-Development-Manufacture.......... p 61
Conference.......... p 63

ABSTRACTS... p 64

On Our Cover

On our cover can be seen the printed circuit designing shop of the SZKI [Computer Technology Research Institute and Innovation Center]. The hardware development being done at the institute serves primarily to modernize their own technology. The appearance of new parts (e.g., SMD) places greater demands on the designing, manufacture and testing of printed circuits. The ELEKTROCAD design shop of the SZKI is based on a Proper-16W computer and is suitable for designing fine printed circuit drawings. In addition to the customary design programs, manufacture is aided by documentation, master film, drilling and parts mounting programs. The article by Jozsef Drasny describes the system.

SZKI Shop

In his article titled "Knowledge Base Modeling on PROLOG Foundations" Istvan Futo [as published, the correct names seems to be Ivan Futo] describes a new type of computerized modeling tool. He provides an interesting summary for those unversed in the field. He describes the basic properties of the language through examples. He relies largely on the MPROLOG version of the SZKI. He describes TC-PROLOG and the modeling of parallel processes and the application of this. The PROLOG processor described by Peter Garami is the result of hardware development supporting high level languages. Another big area at the institute is research on and use of image processing systems, as described in the article by Jozsef Szabo.

Hobbytronics

The article by Ferenc Alpek, Peter Hanak and Tibor Torzsai introduces a new area for use of C-64 personal computers. They use their computer to control simple measuring instruments and to process their data. They describe two applications for solving measurement tasks common in the machine industry, where it measures precisely, with incremental measurement sensors, the geometric dimensions of a workpiece, evaluates the measurement data and passes them on for additional computer processing.

8984
CSO: 2502/49

HUNGARY: MODELING ON THE BASIS OF PROLOG

Budapest MAGYAR ELEKTRONIKA in Hungarian No 2, 1987 pp 14-17

[Article by Ivan Futo: "Knowledge Base Modeling on PROLOG Foundations"]

[Text] In the article we describe a new type of computerized modeling tool. The TC-PROLOG combined discrete/continuous simulation system is avalid extension of the PROLOG logic based programming language. Exploiting the basic properties of PROLOG it is possible to modify the model while running, automatically, based on multiple step logical inferences, and to go back in simulation time and try out new alternatives in the event of dead-lock or unacceptable intermediate results. The discrete version is for IBM-PC XT/AT personal computers, the combined version is for Macintosh personal computers and runs on Siemens and VAX large computers.

Introduction

As a result of the announcement of the Japanese so-called fifth generation computer projects attention has again turned, since 1981, to research on artificial intelligence. According to the plans these computers will have deductive/inductive capabilities characteristic of human thinking.

In Hungary--well before the Japanese announcement--interesting results were being achieved in 1975 in the area of using PROLOG, a logic programming tool then known to only a few experts. The Hungarian results were based on a domestically made PROLOG system which was the second such interpreter after the original French one made at the Marseille University in 1972.

In 1978 the idea arose that the PROLOG language should be made suitable for description of parallel processes and for modeling such processes, preserving the good properties of the language inherited from mathematical logic, such as:

--declarative and procedural semantics (Horn formulas),
--an automatic inference ability (theorem proof), and
--pattern matching and back-tracking.

T-PROLOG, suitable for modeling discrete processes, was ready by 1982 and TC-PROLOG, suitable for describing both discrete and continuous models, was ready by 1985.

The PROLOG Language, MPROLOG

Recently many articles, books and reports have appeared about the PROLOG language, thanks to the Japanese, who selected this language as the "machine code" for the fifth generation computers. We should sum up the basic properties of the language in at least a few lines.

A PROLOG program consists of three sorts of basic elements:

--statements of fact, which express a simple truth, for example

```
     good-film (gandhi),
     capital (hungary, budapest).
```

--inference rules, which represent an implication, for example

```
     goes-movies (Someone):-
          good-film (Film),
          interests (Film, Someone),
          has-ticket (Film).
```

according to which "Someone" goes to the movies if the "Film" is good and the "Film" interests "Someone" and he has a ticket for this "Film". Variables are indicated with initial capitals and constants with small letters.

--a goal or question, for example

```
     ? goes-movies (rozi),
```

which we interpret to mean, "Is Rozi going to the movies?"

Now let us look at an example of a complete PROLOG program using the concepts described above! In the article we will use the MPROLOG version of the SZKI [Computer Technology Research Institute and Innovation Center].

```
/1/ goes-movies (Someone):-
     good-film (Film),
     interests (Film, Someone),
     has-ticket (Film),
/2/ good-film (gandhi),
/3/ good-film (colonel-redl),
/4/ interests (colonel-redl, rozi),
/5/ has-ticket (gandhi),
/6/ has-ticket (colonel-redl),
/7/ goes-movies (rozi).
```

(More precisely, a fact or rule conformable to the statement "interests /gandhi, rozi/" does not figure in the database of the program.)

So, the MPROLOG program runs successfully and Rozi goes to the film titled "Colonel Redl."

The so-called pattern matching performed the "assignment of values" while back-tracking occurred when the pattern matching was unsuccessful.

[A figure with the article illustrates in tree form the running of the program: "gandhi" does not interest Rozi so there is back-tracking to select an alternative.]

Modeling Parallel Processes in PROLOG

The original MPROLOG system--like all other standard PROLOGs--is not suitable for description of parallel processes or for the modeling connected with them. So the original language had to be extended in an appropriate way. Possibilities had to be provided for:

--creating and erasing processes (new (...), delete-process (...));
--time management (hold (...));
--messages and suspend until a condition (send (...), wait for (...), wait (...)); and
--description of continuous components (differential equations).

[Note: The programming words in parentheses are in English in the original article.]

We realized such an extension with the TC-PROLOG system, in which it is possible to:

--automatically modify the model during execution on the basis of multi-step logical inferences, and
--have automatic back-tracking in time in the event of dead-lock or unacceptable intermediate results.

The TC-PROLOG System

We will illustrate the operation of TC-PROLOG with a simple example.

There is a small space system consisting of one control center and one space ship. The control center (discrete component) gives the name of the object to be studied to the space ship (continuous component). The space ship determines the distance of the object and tries to reach it with even or accelerating movement. Let there be possible targets alpha and beta; the distance of beta is 550,000 kilometers. Let the space ship travel at a speed of 100,000 km/h and let acceleration be 10,000 km/h^2 in case of need.

We begin to model the task at time 0, and the space ship must reach some object within 5 time units.

sv(y) is the momentary value of the y variable,
dv(y) is the momentary value of the first derivative of the y variable.

Using the "simulation" procedure (clause in PROLOG terminlogy) described in the SZKI MPROLOG Reference Manual we create two processes through two "new

(-,-,-,-)" calls. The name of the first process is "control-center" and that of the second is "space-ship." So the activity of the control center is "target-determination" and that of the space ship is "traveling."

Control Center

```
(1) target-determination:-
     possible-target (Target),
     send (the-target (Target),)
     wait-for (we-arrived).

(2) possible-target (alpha),
(3) possible-target (beta).
```

Space Ship

```
(4) traveling:-
     wait-for (the-target (Target)),
     distance (Target, Distance),
     wait-condition (sv(y) >= Distance),
     send (we-arrived).

(5) distance (beta, 550000).
(6) initialization-of (space-ship):-
     sv(y):=0.

(7) equations-of (space-ship):-
     dv(y):=100000;
     dv(y):=sv(y1),
     dv(y1):=10000.

(8) step-size (space-ship, 1).
```

```
(9) simulation:-
     new (target-determination,
            control-center, 0, 5),
     new (traveling, space-ship, 0, 5).
     ? run (simulation).
```

Both processes start at time 0 and their activity must be completed by time 5.

Communication between the two processes takes place in the form of message exchange through the built-in "send ()" and "wait-for ()" procedures. A process the control of which runs on a "wait-for ()" instruction is suspended until a suitable message (which can be fitted to the argument) is received.

Under the effect of a "wait-condition ()" instruction a process is suspended until the condition prescribed (sv(), dv()) for a state variable determined in the equation giving the continuous component and figuring in it is fulfilled.

The second alternative in 7 above (we separate the several alternatives with ";") is a canonical rewriting of the equation $y^{(2)}=10,000$, so we always get a first order differential equation.

$$y^{(1)}=y_1$$
$$y^{(2)}=y_1^{(1)}$$

The solution of the task is reaching object "beta", backtracking twice:

--one backtracking is after choosing alpha, because the space ship cannot determine its distance;

--one backtracking is in the last hour of traveling in a straight line with

even movement, since the distance thus made is only 500,000 kilometers;

--then the system returns to time t=0 and the space ship tries to reach the target aimed at with even acceleration.

An Application of TC-PROLOG

Of the applications of the T/TC-PROLOG described by us the largest, in regard to size of programs and number and time of program runs, was a preliminary simulation study of the multiprocessor PROLOG computer of the Toulouse university, which is continuing. (C. Simon, "Specification et simulation d'une architecture multiprocesseur PROLOG," Universite Paul Sabatier LSI, June 1986, doctoral dissertation.) In the course of this they determined the number of processors to be used in the elemental units of the machine being designed, the topology of the communication network linking the elemental units and areas of expected use. The simulator was run on 1-4-16-25-36-49 elemental processing units for PROLOG programs consisting of about 100 clauses (procedures). They measured the saturation of the several channels and the utilization of the processors under various topologies and optimization strategies.

During the runs, not rarely lasting 6-8 hours, there were 6,000 message exchanges, the basic unit of simulation time was one microsecond, the simulated running time of the programs varied between 0.6 and 3 seconds.

As a result of the first course of tests they defined an initial version which they intend to realize with transputers and they intend to study additional optimizing algorithms with the aid of the simulator.

The Next Step in Development: Expert Systems and Simulation

Expert systems are special software systems which have highly qualified knowledge of some narrow problem area; they can be used to reason out information not explicitly stored but requiring implicit multi-step deduction (induction).

A number of authors have thought that elements of expert systems might be used in the area of simulation. They generally agree that the following use areas are possible:

--an expert system deciding on the basis of the result of a simulation run at certain decision points;

--a simulation model where some components with decision making possibilities are expert systems while the other components are the usual ones in traditional modeling;

--preparing intelligent front-end (IF) systems where an expert system helps the user in preparation of the appropriate model.

We would like to add to the above three areas a fourth which we consider at least as important as these:

--preparation of expert systems controlling the simulation (a series of simulation runs) itself.

At present we are dealing with preparation of a system satisfying the first two and the fourth condition, based on TC-PROLOG.

The TC-PROLOG system based on MPROLOG of SZKI now works on IBM, VAX, Tectronix and Macintosh+ machines.

The discrete version can also be accessed on the Proper-16 or IBM PC and compatible machines.

Autobiographic Note, Ivan Futo

I graduated from the Electrical Engineering School of the Budapest Technical University in 1972. Between 1971 and 1978 I worked at the NIMIGUSZI [Ministry of Heavy Industry Institute of Industrial Economics and Organization] and in 1975-76 I participated in realization of the first PROLOG applications. In addition to this work I was always interested in use of PROLOG in the area of computerized simulation. After 1971 [as published] we realized the first such system, T/Tc-PROLOG, at the SZKI. In 1985-86, as guest professor, I participated at the Toulouse university in logical and simulation work on a multiprocessor PROLOG computer where we did, and are now doing, the simulation in T-Prolog.

8984
CSO: 2502/49

HUNGARY: PROLOG PROCESSOR FOR PC'S

Budapest MAGYAR ELEKTRONIKA in Hungarian No 2, 1987 pp 18-21

[Article by Peter Garami: "PROLOG Processor for Personal Computers"]

[Text] Introduction

With the great increase in the popularity of the PROLOG language--in which a significant role was played by the Japanese fifth generation project--not only have various implementations and further developments of the language appeared on virtually every continent but efforts on hardware support have begun as well. A broad scale of realization ideas saw the light of day first in the literature; then the devices appeared, from high performance special computers breaking the entire PROLOG execution process into parts and supporting elemental operations to simple 1-2 card auxiliary processors for existing computers which support only a few functions.

The appearance of hardware devices supporting very high level languages is timely and justified today. The development of IC designing and manufacturing technology brought a hardwre renaissance and restored the balance of the hardware-software ratio. Just as Texas Instruments has produced a LISP circuit with a parts density of 550,000 transistors per square centimeter operating at a frequency of 40 MHz to support the LISP language, coming half a step before PROLOG, so the next step in PROLOG support will be production of a very highly integrated, perhaps wafer integrated, PROLOG machine. Present architectures--in addition to being themselves tools which can be used well for these languages and for developing artificial intelligence tools such as expert systems--are also experimental emulators for the development of these circuits.

As a first step on this developmental scale the SZKI [Computer Technology Research Institute and Innovation Center] chose the simplest solution, one requiring relatively little investment. With a traditional element assortment, a few hundred integrated circuits, we realized a coprocessor (PROLOG processor) which can be connected to a Proper 16 or IBM PC to increase the efficiency of the MPROLOG system. At present we are working on a multiprocessor further development of this.

Developmental Goals

Using MPROLOG in a personal computer environment we also, naturally, faced the increased processing and storage demands of artificial intelligence tasks.

On a personal computer the user often "outgrows" the device he is working on; sometimesthe processing speed is insufficient for real-time responses, or the limited memory capacity makes execution of large tasks clumsy and forces the computer to use more complicated memory management (overlapping memory use, virtual memory management, garbage collection, etc.) which also hurts efficiency and speed.

By providing computing power and a memory expansion directly accessible for MPROLOG the PROLOG processor is capable of serving the more demanding, in terms of computation and memory, class of artificial intelligence tasks.

Our basic goal was to make use of the entire MPROLOG system possible in a personal computer environment, with an unchanged user interface.

In the first phase of the development we worked out an auxiliary processor solution where the auxiliary processor does not contain an operating system; it executes the components of the MPROLOG system at a speed (8 MHz) greater than the Proper-16, with a 32 bit internal data processing capability and 2-4 M bytes of directly accessible memory.

The PROLOG processor has a 32 bit internal structure, so with some program development steps (pretranslation, consolidation) it gives a speed 5-7 times greater than the Proper-16 or IBM PC/XT. The speed of interpretation is 1.5-2 times greater; in the case of connection to an IBM PC/AT this advantage does not appear with the faster host processor.

From our viewpoint a significant element of the system is the MPROLOG compiler, which makes possible a speed at least 10 times faster compared to interpretation. We should note that at present the MPROLOG system does not provide for use of the MPROLOG compiler in the 16 bit world (Proper, PC).

The 2 or 4 M bytes directly accessible for MPROLOG permit a significant increase in the MPROLOG stacks and tables. Using in this storage area the system configuration options used in MPROLOG makes it possible to create a 500,000 element statement table during interpretation.

In the second phase of development we are striving, in addition to the above--technological--advantages, to create in a general purpose multiprocessor system a distributed system for PROLOG program execution which will, on the one hand, speed up the computer even more and, on the other hand, offer possibilities for qualitatively new task solutions.

The multiprocessor system consists of a master processor, a main memory and slave processors. The master, controlling the entire system, can use the entire main memory; the slaves work partly in main memory and partly in their own memories. In the event of using their own memory the slave processors do not burden the system bus for frequently executed and localizable functions.

As a first step we wanted to distribute the unification operation in MPROLOG execution among several processors.

We studied a number of strategies in this regard; we tried out two of these with simulation methods--working with a simplified PROLOG interpreter. The method of distributing work among processors which was finally chosen is based on the stratagy of having the slave processors begin processing alternative elements of MPROLOG partitions simultaneously, so each slave processor attempts the unification of one alternative. If this is unsuccessful it turns to processing the next alternative, not yet studied. If the unification attempt succeeds the result of this is preserved in the slave processor and when the master processor back-tracks to this point the execution continues with the result of the pre-prepared unification.

With this algorithm, according to our measurements, two or three slave processors take over 60 or even nearly 70 percent of the actual unifications in some classes of tasks, and as a result execution speeds up by nearly this amount.

Use of several processors in one system creates a number of other possibilities for speeding up PROLOG execution. We should mention as first of these the possibility of strategy control.

During program execution there is for some task classes a requirement for constant checking of certain conditions; some versions change the strategy of program execution when reaching a threshold value. This function could be performed by one or perhaps more slaves while the master processor takes care of the customary tasks of program execution.

A technically similar solution is required by a task distribution more general than the above, where processors of equal value execute MPROLOG programs which are capable of communicating with one another, influencing each other's strategy or simply working on a common database. This task distribution can execute a small number of processes on different processors; in this way, for example, one could speed up the running of some programs written in TPROLOG.

From the viewpoint of development it could be advantageous to use one of the slave processors for system monitoring functions. This would make possible a further refinement of task distribution strategies, realizing a better balance of the system.

Technical Characteristics of the PROLOG Processor

During physical implementation we took into consideration the possibilities of domestic IBM compatible hardware and the results thus far of hardware development at the SZKI. The design for the Proper-16 personal computer was realized on a standard expansion card, exploiting the 32 bit option of the Proper-16 which was developed in 1985. This option, which consists of a Motorola 68000 based processor and--in the basic arrangement--a 2 M byte store, was the hardware base for the first phase of development.

The P32 option works with an independent clock generator, a unit controlled independently of the Proper-16. The two processors communicate with one another through message blocks. Each message block contains the type of command and the parameters for the given command or the result of execution of the command. Two FIFOs, each of 16 bytes, provide intermediate storage of the messages; the M68000 writes and the Proper-16 reads one of the FIFOs and the other serves for communication in the other direction.

Memory is accessed through the Proper-16 DMA channel (with block data transmission) while a VME type separate bus is built between the M68000 and the store. Later we also connected the slave processors to this bus.

The slave processors are connected to the bus of main memory. With their own memory management unit the logical address domain of the slave processors can be mapped to main memory or local memory. The communication of the processors among themselves can be controlled by interrupts supported by a semaphore system.

The software work for the first phase was essentially cutting the MPROLOG system in two in such a way that the Proper base computer executed the operating system functions and the P32 option executed the MPROLOG functions. This splitting was greatly facilitated by the fact that the MPROLOG source contains separately the parts which are independent of or dependent on the computer and the operating system. So by preparing a relatively small interface module it became possible to use half of the MPROLOG system to generate operating system functions for the Proper-16 and half to generate the MPROLOG functions for the Motorola 68000, a solution which greatly facilitated the two processor implementation.

Further development of the software is continuing in the second phase of the development. We are fitting into the Motorola side programs the extensions necessary for limited "OR" parallelism.

The technological realization proves that the PROLOG processor can be installed directly into the Proper-16 housing, requiring 2 card slots in the minimal arrangement. The processor card takes one slot on the I/O bus of the Proper-16. Other slots are occupied by each of the 2 M byte memory cards and each slave card, with 0.5 M bytes memory on it. The cards are prepared with four layer printing. The cards are connected to the VME bus, also realized on a four layer printed circuit card, through a 96 pin connector on the upper side.

These cards--because of their size and different connector systems--cannot be located directly in the IBM PC housing, and in the expanded arrangement one PROLOG processor can require many cards, so we have developed an independent housing version which, with its own power unit and cooling, makes possible operation of four or six cards (a maximum of 1 master, 2 memories and 3 slaves), and we have developed a small size coupling card which can be plugged directly into IBM PC or compatible machines, connecting through a tape cable to an independent device housing.

Using a different coupling card but a similar functional solution we also connected the machine to a Siemens PC-D personal computer, which is IBM compatible from the software viewpoint but different from the hardware and design side. (The processors are being used at a Siemens unit in Munich to develop an expert system to configure MPROLOG based computers.)

The PROLOG processor requires the standard version of the Proper-16 or MS-DOS operating systems; the operating system does not manage the extended memory. Input/output operations are done on the customary peripheral assortment of the Proper-16 or IBM PC. The software solution developed by us is tied to MPROLOG, supports the running of it, and only MPROLOG can use the extended memory. Nevertheless the general purpose microprocessor can be used to support other program systems through a relatively easily managed interface, with the development of the appropriate software components.

The structure realized is also a general one from the viewpoint that it provides a universal tool for various PROLOG strategies, if they can be realized with a Proper-16 (IBM PC) and master processor and slave processors connected directly to it.

As a developmental system we had to use two chains of our existing developmental systems. The developments on the Proper-16 side were done with Siemens and Proper-16 tools and those on the Motorola side were done with Siemens and Macintosh tools. In both cases the CDL2 level developments were done with code generation exclusively on the large machine; translation and editing were done on the small machine, without using the cross-development system. We sent files between the three machines over asynchronous lines.

Summary

Components of the PROLOG Processor

Basic Version:

--The two processor version of the MPROLOG language system
  --32 bit pretranslator
  --32 bit consolidator
  --32 bit interpreter
  --32 bit program development subsystem (PDSS)
--master processor
--2 M byte memory
--in built-in version
  --VME bus back panel
--in independent version
  --device housing with power unit and fan in 4 or 6 card versions
  --a built-in VME bus back panel
  --PC coupling card
  --tape cable.

Expansion Possibilities:

--2 M byte supplementary memory
--a limited "OR" parallel extension of the 32 bit interpreter and associated
--one to three slave processors with 0.5 M bytes memory each
--32 bit compiler
--32 bit interpreter with control of strategies.

Further Development Ideas

At present we are working to finish implementation of two processor MPROLOG system graphics and an external interface for it. At present it is not possible to run programs using MPROLOG graphics, to give host commands directly or use language interfaces. The extension realizing limited "OR" parallelism is being tested; the slave cards for this have been prepared already. We are continually fitting the PROLOG processor to domestically made and imported IBM compatible PCs.

We intend to implement the 32 bit compiler on the basis of the Macintosh version--as with the preceding components. After preparing the Macintosh MPROLOG compiler we must do the portability work.

We regard further research on control strategies as one of the chief directions for further development; we have already done some experiments on this.

As another significant further step we plan to replace the present hardware base with a more developed parts assortment, which will probably result in a significant additional technological acceleration thanks to a 32 bit solution in all information flow, more efficient memory management and a higher operating frequency.

Since 1986 the OMFB [National Technical Development Committee] has also participated in financing research and development activity on the PROLOG processor.

Autobiographic Note, Peter Garami

I obtained my electrical engineering degree in 1971 in the Electronic Computers Section of the Automation and Instrument Industry School of the Kharkov Technical University. I have worked at the SZKI since graduation from the university, in the Hardware Systems Technology Laboratory until 1977 and since then in the Theoretical Laboratory. My professional area is computer architecture and systems technology. I participated in designing work for the R10 and R15 computers developed at the Institute and later joined in realizing some of the tasks in MPROLOG development. At present I am dealing with design of high level language processors.

8984
CSO: 2502/49

HUNGARY: DEVELOPMENT OF HARDWARE AT COMPUTER RESEARCH INSTITUTE

Budapest MAGYAR ELEKTRONIKA in Hungarian No 2, 1987 pp 22-25

[Article by Jozsef Drasny: "Machine Background for Hardware Development"]

[Text] Introduction

Since its formation the SZKI [Computer Technology Research Institute and Innovation Center] has tried to support the development and production of its own computer technology products with computerized tools. In any case this effort derives directly from the fact that the chief activity area of the institute is the development of computer technology devices and applications systems. It is natural in such a place that a computer should be used in device development for there are both the need and the conditions for it. As examples of such applications in the past 10 years we might mention the following:

--a program system for designing printed circuits (KENTAUR),
--manufacturing documentation for printed circuits on a plotter,
--a testing device for microprogrammed systems (MICROTEST), and
--functional checking of assembled cards (SKT).

In recent years the SZKI has appeared on the domestic market with various types of professional personal computers the design of which very closely resembles the earlier large size, cabinet system equipment, and the manufacturing technology does not differ much from that of 8-10 years ago either. In the course of manufacturing and selling these machines thus far it became clear that in the interest of staying on the market it was necessary to renovate the hardward design, and especially the entire developmental and manufacturing technology. The need for renewal appeared already with the first series, but at the number of units being manufactured an economical technical solution could not be found. But with the appearance and spread of the new surface mountable parts (SMDs) a realistic opportunity opened up for suitable innovation. Mounting the SMDs can be automated with tools which are more simple and cheaper than before. And with automation the assembly work becomes cheaper and the quality of the finished product improves significantly. So finally better equipment can be sold more cheaply, which is a condition for survival in market competition. With such products one can find customers or cooperation partners on the foreign market as well.

Naturally a technological exchange does not mean simply changing parts. Use of SMDs and automation of assembly (mounting) also makes necessary new solutions in other important design and technological steps:

--designing: new design elements and a different design system;
--production of printed wiring cards: "very fine" masks;
--soldering: melting methods, wave soldering of SMDs on large printed cards;
--testing systems: at parts, printed circuit and assembled card levels.

Increased use of computer technology accompanies the technological development--in designing work, manufacturing processes and testing techniques alike. In the first phase of the developmental work we are using the following computer elements of an integrated designing-manufacturing system:

1. Parts catalog,
2. A materials record keeping system,
3. A circuit designing and machine documentation system,
4. Computer controlled automatic equipment to test printed cards,
5. Computer controlled automatic equipment to mount SMDs.

In what follows we will describe, of these, the recently completed circuit designing program system and the automatic equipment to test printed circuits, which has been in operation for about one year.

ELEKTRO-CAD

The designation ELEKTRO-CAD has two meanings:

--a designing workshop to design printed wiring cards, the sum of the hardware and software elements constituting this; and

--the card designing program system which can be run at the designing workshop.

The Components of the System

Figure 1 shows the hardware components of the ELEKTRO-CAD designing workshop. [All these components are described in the next three paragraphs.]

The Proper-16W personal computer has:
--768 K bytes operational memory (256 + 512 K),
--720 K bytes floppy disk storage, and
--27 M bytes hard disk storage.

The data for the color graphics raster monitor are:
--20 inch screen,
--1024 x 1024 pixels addressable,
--640 x 480 visiple pixels,
--simultaneous display of 16 colors.

Of the peripherals the alphanumeric monitor and keyboard connections are integrated in the central unit of the Proper-16; the tablet, plotter and

matrix printer require the usual coupling cards; the tape punch has a special connection (according to type).

The chief functions of the program system are:

- --database management,
- --interactive designing tasks:
  - --input of circuit diagram,
  - --locating parts,
  - --cable route design;
- --automatic cable route designing,
- --subsequent processing:
  - --preparation of parts inventory and other textual documentation,
  - --data carriers for various plotting, manufacturing and testing tools:
    - --plotter (master film, mounting diagram, circuit diagram, etc.),
    - --drill (printed sheet, test automat adapter),
    - --automatic mounting equipment (online connection),
    - --basic graphic functions (in every designing step),
    - --enlargement and reduction (zoom),
    - --windowing,
    - --color selection,
    - --drawing shapes (line, polygon, circle), etc.

Chief Functions of the System

Database Management

The database consists of two main parts: libraries, and the data for the current designing task.

The libraries of the system contain descriptions of elements repeatedly used. So there are:

- --a parts catalog, which contains two sorts of data by part:
  - --the individual characteristics of the given part with an actual description (designation, designation of substitutable parts, other specific data);
  - --characteristics common to many parts with citations to other catalogs (design, pin arrangement, drawing symbol),
- --design descriptions with parts data needed for designing (arrangement of pins, sizes of pins, capusle dimensions),
- --description of assembly of pins, which describes the input and output points of the various logical elements within an IC capsule;
- --a drawings library, which contains the drawing symbols of the parts on the screen and, according to the depiction requirements in various documents,
  - --logical elements (for circuit diagrams, in depiction according to basic element and part),
  - --parts drawings (for the mounting drawing).

Putting in the Circuit Diagram

For the printed wiring circuit to be designed every circuit function must be realized in such a way that the printed sheet bears the necessary parts and that there are connections between them on the surface of it. The first step in solving the designing task is to communicate to the computer the electrical connections of the circuit to be realized, giving the parts and the connections among them (and certain supplementary information).

In the ELEKTRO-CAD system putting in the circuit diagram means essentially providing drawing type data; the circuit diagram can and must be drawn on the screen with graphic editing functions. The graphic tools and programs necessary for this are available:

--the digitizing tablet,
--the color, graphic monitor, and
--the drawings library.

Producing the circuit diagram on the screen generally consists of the following steps:

--calling the parts or logical elements from the library to the screen,
--assigning an identifier (e.g., serial number) to the elements called,
--giving the connections:
  --graphically (with lines), or
  --by citation (by assigning names to the nodes).

The following graphic functions aid drawing preparation:

--copying drawing elements (picking them up and putting them down repeatedly),
--fitting the lines to the raster net,

and naturally all the other basic graphic functions (magnification-reduction, erase, insert, move, use of multiple planes, color, etc.).

During input (drawing) the program constantly checks the designing rules and tries to reduce the possibilities for error:

--it will not accept a part without element identifier,
--one cannot give the same identifier to several elements,
--it indicates shortcircuits between nodes with various names.

At the end of the run:

--it indicates pins not connected in and
--nodes without a signal source.

The finished circuit diagram is preserved in the designing database (base file) for further processing, but for documentation purposes it can also be printed out on the plotter. Figure 2 shows a detail of such a drawing. [Two full page color drawings accompanied this article as inserts.]

Placing the Parts

Indicating the location of the parts can also be done in an interactive mode with the aid of graphic tools in the following steps:

--display a picture of the printed sheet on the screen,
--calling the part (basic element) and placing the symbol at the selected spot (in a design drawing proportional in size to the printed sheet).

The chief functions in operation when placing are:

--placement according to address matrix or optional cursor position,
--basic element level or parts level placement (with the former several elements could go in one IC capsule location),
--turning parts,
--checking for collisions and intersections (parts with each other, parts with forbidden areas or border of design area, etc.).

Designating the location of a given part is the task of the designer, but the program offers help for this:

--along vertical and horizontal intersecting lines pre-designated on the printed sheet it constantly indicates the number of leads to pass through them later and the greatest calculated load for every intersection (the maximum number of leads permitted),

--when changing the location of parts it indicates the change in line loads at the intersections affected,

--with connecting lines it indicates the connections of the part designated for insertion with the other parts already inserted.

During the placement process the names of the parts not positioned can be listed; elements which do not exist cannot be used.

Planning the Wiring

The location of the connecting leads can be designated in two ways:

--mechanically, on the basis of design data and a knowledge of the design rules, by following appropriate algorithms; or

--in interactive graphic operation, according to the perception of the designer, with machine checking of adherence to the design rules.

Realization of automatic wiring has not been completed at the time of this writing so we will not describe it here (completion is planned for December 1986).

Interactive designing could be used as a supplement to mechanical design, alternating with it, or as the exclusive method in extreme cases. Special leads and lines not designed by the automatic designer can be put on the printed sheet only in this way and it is useful to make changes this way.

In interactive designing the designer sees an image of the printed sheet and the already finished drawings on the screen. New drawings can be made with the aid of the graphic functions, in many ways similar to the preparation of the circuit diagram. The chief difference is that here the lines and other shapes appear on the screen in their actual dimensions (to the scale of the drawing) so one can follow their connections and how much space they occupy. (In the interest of faster operation it is also possible to depict lines, holes and solder points only symbolically.)

In this phase the chief designing steps are the following:

--display the design picture on the screen (borders of design area, forbidden areas, pin holes for parts, forms already in place, etc.);

--designation of the signal (node) to be connected (the straight line connections between the points belonging to a selected signal can be displayed in different colors as desired);

--connecting the points of the signal according to the design rules, with lines and through-holes (the drawings of different layers are displayed in different colors).

Before drawing down every single drawing element the program checks adherence to the design rules (shortcircuit, isolation distance) and does not permit a drawing to be included in the design data which is not suitable from this viewpoint.

The results of wiring design can be printed out on the plotter also. Figure 3 shows a detail of such a drawing.

Subsequent Processing

The design results are stored in the database and are available for further processing. It is the task of the subsequent processing to prepare various documents and data carriers from this data file. So far the following such subsequent processing programs have been prepared:

--photoplotter control (to prepare master films),
--drilling machine control,
--preparation of parts lists and combined materials lists,
--preparation of circuit diagram on a color plotter.

The number of additional programs can increase as desired; additional programs are being prepared already (preparing punch tape for drilling test adapters, online data transmission for automatic mounting equipment, preparation of mounting drawings).

An Automatic Testing Device for Printed Wiring Cards

At present the two and multiple layer cards of the SZKI are made on jointly owned machines with a jointly developed technology at the Electronics Technology Faculty of the BME [Budapest Technical University].

Break and shortcircuit tests of the cards are done at the SZKI with an imported needle bed automatic testing device. The institute tests not only its own cards but also the products of other enterprises, research institutes, etc. on order.

Testing a printed wiring card consists of two phases.

Adapter Preparation

A test adapter has to be prepared for each type; its parts are:

--two plexiglass sheets, drilled at the test points,
--spring test needles,
--other fittings (spacers, matching pins).

The control tape made to drill the printed cards can be used to drill the plexiglass sheets too. But in most cases it is better to leave out the through-holes for leads and frequently one must test points without holes as well (direct contacts, pins of SMDs, etc.). So on the basis of the data of the computerized designing system a new punch tape is prepared at the SZKI to make the adapter, and this meets the above requirements.

Before the test the plexiglass sheets must be mounted on the so-called base sheet with appropriate spacers. The base sheet is also made of plexiglass and has holes drilled at 2.54 mm intervals for the entire test surface. The structure thus assembled, consisting of three parallel sheets, must be filled with test needles so that there is one needle for each test point.

Finally the completed structure must be placed into the automatic device, fastening it to the pins fitting the holes in the base sheet provided for this purpose. The device is then ready to test.

Testing

The test begins with "teaching." First, with the shortcircuit sheet fastened to the test needles and at the proper control command, the device "counts" the test points and notes their location. Then, selecting a printed card of the type to be tested which is known to be good and placing it on the test adapter the device can be instructed to "study" the connections (prepare the test program).

The technical execution of the test is extraordinarily simple:

--place the card to be tested on the adapter (the contact needles),
--with the closing of the device cover the adapter (the needles in it) and the card to be tested are brought together (the test takes place),

--open the cover and remove the card.

The test can show breaks in the leads, shortcircuits and improper conductive ability (insulation). The machine communicates the results on a small printer.

It may be interesting that, on the basis of nearly a year of operation, the ratio of faulty cards tested was 22 percent. The basis for the statistics is not only cards of the SZKI-BME but also those of other manufacturers.

Autobiographic Note, Jozsef Drasny

Graduate electrical engineer and chief of a main department. I obtained my diploma in 1959 at the Electrical Engineering School of the BME. My first job was in the Cybernetics Research Group of the Hungarian Academy of Sciences where I participated in development of the first Hungarian electronic computer, the M-3. I also had many other computer technology tasks here later--hardware and software development, testing, etc. Since 1969 I have dealt with computerized designing at the SZKI. Our chief task at present is introducing the surface mounting technology and developing the computerized support necessary for this.

8984
CSO: 2502/49

HUNGARY: DIGITAL IMAGE PROCESSING SYSTEM FROM SZKI

Budapest MAGYAR ELEKTRONIKA in Hungarian No 2, 1987 pp 26-30

[Article by Jozsef Szabo: "Image Processing Systems and Their Applications"]

[Text] In our day digital image processing methods have moved from the research laboratory into everyday practice. The article provides a review of the achievements of the Computer Technology Research Institute (SZKI) in this area. It describes the MIP and VIKING image processing systems and gives a brief review of other systems and applications.

Introduction

In 1975, when our institute showed at the Budapest International Fair a computer, with TV camera input, to control equipment transporting piece goods and its first color image processing device using the raster principle, even a significant number of professionals evaluated the effort as only a flashy game.

Today--thanks primarily to television--even the average person far from image processing and computer technology meets with computerized image processing, for image processing systems aiding processing and evaluation appear regularly in reports about use of artificial satellites, space research, new evaluation of medical images or even the discovery of the remains of the Titanic. Digital image handling tools are fondly used in the preparation of entertainment TV programs; essentially these are goal oriented versions of equipment used in image processing.

In this article we will describe the activity of the Mathematics Laboratory of the SZKI in the area of image processing, primarily in the period from 1983 to today, because a summary of the developmental goals of the laboratory and of the results we achieved prior to 1983 appeared earlier.

We do not intend to deal with the concept and problems of digital image processing in general; the reader can already find information about this in the Hungarian language. We will start from a user or applications approach, and we hope that even readers not versed in the theme will sense the utility and significance of the systems described.

Color Display Equipment

The equipment which has become known by the name CDP is equipment which creates a link between analog devices, usually TV, and a digital computer. The structure of this can be seen in Figure 1; the principle of operation is briefly as follows.

The incoming video signal goes to an analog-digital converter. This performs sampling and quantification. The numerical values appearing at the output, proportional to the illumination of the given pixel, are written to the appropriate address byte of the refresh memory, thus creating the digital image. There is a mutually unambiguous correspondence between the memory addresses and the geometric location of the pixels. The refresh memory has a direct link to the main memory of the computer. So the digital image can be read into the computer or the result of processing can be written back to the refresh memory.

The digital-analog converter automatically generates a video signal corresponding to the momentary content of the refresh memory with the output recolor table (look-up-table) and using this video signal the image in the refresh memory can be displayed.

The refresh memory stores an image consisting of 288 lines with 384 pixels per line; there are 6 bits per pixel. This means that one can display 64 shades of gray or--in the case of a recolored image--64 colors.

The MIP System

The MIP system is used primarily to process multispectral space and aerial photographs, but it can also be used as a general purpose image processing system. It can be run on members of the TPA-11 series or compatible computers under the RSX-11M operating system. The 52 different programs consisting of about 180,000 instructions create the following subsystems:

--data conversion programs,
--image improvement procedures,
--operations between image bands,
--geometric corrections,
--orthogonal transformations,
--statistical computations,
--classification procedures,
--image detail designation,
--display functions,
--information programs,
--service programs.

The flexible data management used permits combined handling of any size of multiple band images and makes possible selective processing of image details defined by polygons or masks. The majority of the applications presume conversational mode operation so the user is helped by menu control and HELP tables. There is also a possibility for direct program initiation and giving

commands. (In the interest of convenient handling of programs with long running times and processing sequences which have become routine the programs can also be started from a previously provided command file.)

It is worth noting that in this system we use a four image-plane version of the previously described CDP which is well suited to multiple band processing; in this version a microcomputer controls the selection and display of the image plane. Figure 2 illustrates the connection between the two computers and the memories.

The system includes a COROLLPRESS-4 turning drum plotter suitable for preparation of 40 x 40 cm color paper pictures.

In addition to a report published in the developmental phase a number of publications have appeared connected with theoretical questions of parts of the system and with use of it.

Figure 3 is a composite picture produced by computer from a combination of photographs taken with the LANDSAT satellite in the infrared and visible ranges, showing a detail of Komarom County. [Note: The Figure 3 published with the article is a block diagram. Color photographs identified as figures 3, 4 and 6 appear as inserts in the magazine.] Using image improvement procedures aiding visual analysis and the computerized classification methods of the MIP system we succeeded in producing a land use map of Komarom County, with the cooperation of workers at the Geographic Sciences Research Institute of the Hungarian Academy of Sciences.

Figure 4 was prepared starting from high resolution data of the TIROS meterological satellite, with the cooperation of workers of the Meteorological Service and the VITUKI [Water Management Scientific Research Institute]. In the picture one can well distinguish the line of the snow covered Alps, displayed in white, the Istria peninusla, the central northern part of Italy and the dark blue, warmer Adriatic. We displayed cloud cover in yellow.

The utility of the MIP system is proven by the fact that in addition to two domestic users two Soviet users have so far purchased a version of the system adapted to the SZM-4 computer. An interesting feature of the latter is that in addition to the image processing site located with the SZM-4 computer, an additional remote image processing unit was installed, connected by a switched telephone line.

Considering that in one case they had to use a hybrid transmission link between Moscow and Tashkent, which works with a communications sputnik and a microwave section, it became necessary to develop a special error management procedure. Image packing coding is used to reduce the image transmission time which increased with the extra information needed for error management.

The VIKING System

The VIKING system works on the hardware base which can be seen in Figure 5. [This is identified as Figure 3 in the article.] The basic machine is a Videoton R-11 Computer; two independently coupled CDPs, a COROLLPRESS-4 color

raster printer and a special processor speeding processing constitute the additional equipment needed for image processing.

The separate connection of the displays makes it possible to have interactive evaluation in parallel with automatic mode processing.

Modifications on a special processor developed for geophysical purposes by the Lorand Eotvos Geophysical Institute and development of new microprograms have accelerated some image processing functions by an order of magnitude.

The 105 independent functions of the program system are organized into a hierarchictree structure; the individual functions can also be executed independently of one another. The system is also suitable for processing a photograph series; that is, it can be used for pre-processing and storage of pictures arriving continuously from the camera or video recorder. The time to process each picture is a function of the running time of the programs in the function series defined by the user; the average running time of a typical pre-processing and decision procedure is 40-50 seconds. The more demanding processing of individual pictures is also possible.

The program assortment which has been developed is suitable for classifying objects located in a relatively homogeneous background according to size and form, for processing a series of such pictures and for combined evaluation. In Figure 6 we show the individual steps in a typical evaluation process. The processing path is determining the number of and classification of the cells which can be seen in a microscopic section. A more detailed description of the system can be found in the materials of the Applications '86 conference.

We get the first picture in Figure 6 by digitizing the signal of the TV camera fitted to the microscope. The result of the program improving the unevenness resulting from the illumination can be seen in black and white in the second picture and in pseudocolor in the third picture. The fourth picture shows the cutting to two levels, that is, the separation of the background and the parts which are valuable from the viewpoint of further processing. It frequently happens that there are parts inside the valuable spots which have the same shading as the background. A program fills the "holes" which thus arise in the manner which can be seen in the fifth picture. Frequently the cells are contiguous; they are separated with an erosion algorithm. In the sixth picture we have designated points at the same distance from the edge of the spots (going inward) with the same color. If the level lines do not converge to a single point then, going out from the "junction points," we can determine where the contiguous spots (cells) must be cut from one another. The seventh picture depicts the cells which have been cut apart. After this phase we can classify the spots by size and count them. Frequently there is also a need for classification according to shape. The eighth picture shows an example of this, on the basis of circle, ellipse and angular.

Other Applications

A number of micro and personal computer systems have been prepared for less demanding image processing tasks. Of the developments of recent years we should mention the system based on the M08X computer for here, unlike the

others, a thermovision camera provides the input image. The direct connection makes possible immediate evaluation of thermal images and archiving in a form suitable for later computerized processing. The development made use of the experiences of earlier cooperation with the Vascular and Heart Surgery Clinic of the Budapest Medical Sciences University.

Image processing devices are also used in preparing TV programs; we used our microcomputer systems successfully in preparing a few productions. The tricks are based in part on the fast color changes possible with the CDP recoloring table and partly on use of special graphics programs. With the ever swifter spread of video technology the demand in this area will probably increase. We should mention the G3D graphics program package capable of three dimensional and stero image portrayal in a listing which is far from complete. The programs can run on computers in the TPA-11 series; at present we use CDP for display but with minimal adaption work they could be used on vector and raster display devices.

Further Development Plans

Without doubt professional personal computers will receive an ever greater role in image processing in the period ahead. Since IBM plays the leading role on the market it is obvious that the development of image processing systems used on the PROPER-16, an IBM compatible machine in the personal computer category, will come to the fore. This does not mean an end to developments in the minicomputer category but rather--in accordance with ever increasing needs--an expansion of the applications spectrum with image processing systems in the cheaper category.

Whether we are talking about personal computers or minicomputers there is a need for modernization of the display devices, perhaps replacing them with equipment with better technical parameters. We plan an improvement in both geometric and gradation resolution. Development of a 512 x 512 x 8 bit and a 1024 x 1024 x 16 bit system is under way, taking into consideration the needs of the various use areas.

Naturally we also plan to develop software exploiting the possibilities of the new devices.

Simultaneous with the appearance of local image processing systems based on personal computers there will be an increase in the need to connect these work sites to large capacity centers, which will encourage an increase in developments connected with image transmission.

We are placing ever greater emphasis on development of new computer structures and hardware devices, because due to the large data volume and computational demand the serial machines used are actually not suitable for image processing. In the future we intend to deal with development of systems suitable for parallel processing.

Autobiographic Note, Jozsef Szabo

I graduated from the mathematical physics department of the Natural Sciences School of the Lorand Eotvos Science University in 1968. After teaching for two years I took a position at the SZKI. In the beginning I participated in program development work for various minicomputer applications systems. I worked in the ESZR [Uniform Computer Technology System] work group dealing with applications programs. Since 1976 I have been deputy chief of a main department in the Mathematics Laboratory and I also have the task of guiding the Number 1 Image Processing Department. Since 1978 virtually all the capacity of the laboratory has been devoted to development of image processing systems and related research. I deal primarily with image improvement methods at the theoretical level. I also cooperated in working out a number of OMFB [National Technical Development Committee] studies and conceptions dealing with image processing and the use of data obtained by remote sensors.

8984
CSO: 2502/49

POLAND's 1986-1990 S&T AIMS

Warsaw PRZEGLAD TECHNICZNY in Polish No 50, 14 Dec 86 pp 13-15

[Article by W.G.: "Ambitious Goals"; preceded by an editorial introduction printed as a sidebar]

[Text]

The first "insert" on the Committee for Science and Technological Progress at the Council of Ministers was published in PRZEGLAD TECHNICZNY in October 1986. We decided to inform our readers of the principles of the programs and the mechanisms aimed at accelerating the pace of scientific and technological progress in the economy and popularizing the joint efforts undertaken in the framework of the Comprehensive Program of Scientific and Technological Progress of CEMA Member Nations up to the Year 2000.

"We would like information about the activities of the Committee and the Presidium," said Vice Premier Zbigniew Szalajda, the chairman of the Committee for Science and Technological Progress, in an interview with PRZEGLAD TECHNICZNY, "and about all initiatives, steps and plans taken by the Committee to be reported regularly in PRZEGLAD TECHNICZNY. We believe that this periodical is now and will continue to be not only an informational forum and a rostrum for sharing of experience, but also a good place for acknowledging the contributions of creative workers in science and engineering even more often than this is done."

Today we present once again the report on the scope of issues that concern the Committee, although we must acknowledge that we have not been able to either provide sufficient coverage of these activities or do this regularly. The publisher has limited the size of PRZEGLAD TECHNICZNY from 48 to 32 pages and reduced circulation by 20,000 copies; by the irregularity of its publishing PRZEGLAD TECHNICZNY has set not just a national but a world record. In preparing the current material on scientific and technological progress, the publication delay of the magazine is six weeks. This is certainly an obvious obstacle in performing the function which theoretically must be performed by scientific and technical information in the proper sense of the word and of which technical publications are the most popular form.

The Committee for Science and Technological Progress held a session on 6 Nov 1986 attended by Professor Tadeusz Porebski, member of the Political Bureau of the Central Committee of the PZPR and secretary of the Central Committee. The topics of the discussion were: the development plan in science and technology for 1987; the schedule for implementation of the resolution of the 10th Congress of the PZPR in the fields of science and technology; and statutes on innovator units. The discussions were focused on the principles of Poland's information policy in science and technology, a comprehensive program of development of scientific and technical information and the principles and a draft statute on scientific and technical information.

Some of the subjects discusssed at the session of the Committee are presented in the following paper.

[Article]

The program of scientific and technical development for 1986-1990, prepared by more than 3000 experts and specialists, is an integral part of the National Socioeconomic Plan, which presents an overview of the government's intentions, wishes and objectives in the spheres of scientific research and technological progress. I do not feel myself sufficiently competent or adequately briefed to evaluate the areas of concentrated interest charted in this plan and the fields assigned as major targets in the introduction of technological innovations, new designs and concepts. For this reason I believe that describing the general program without comments and appraisals should be of an informative and interpretative value, especially if it is described in comparison with our capabilities and the current stage of science and technology in the world.

The program postulates that between 1986 and 1990 research-and-development organizations in industry will create a total of more than 4000 new designs, about 2000 new or modernized industrial processes and about 100 new materials. These ambitious goals imply doubling in the next five years research-and-development expenses; an important condition of success will be rapid growth of manpower potential and the material base of the research-and-development infrastructure.

What goals have been set? They include resolving power, food, raw materials and ecological problems--in other words, reducing the technological gap separating Poland from the modern world. This must be achieved by technological progress organized by the decision-making center, which has established the priorities, the areas of concentrated efforts, the allocation of funds and methods of program implementation.

Concentration of Efforts

The Committee for Scientific and Technological Progress, in its program of scientific and technological development, has adopted a four-level hierarchy of problems to be resolved. The first level is one of programs of basic research which is crucial for the long-term perspective. The second level

is comprised of research-and-development programs which will be the main vehicles of technological progress. The third level is that of government contracts, which will guarantee that this technological progress will be put into effect. Finally, the fourth level, of a relatively narrow importance, is concerned with the specialized industry-wide research programs which will supplement the work conducted at the other hierarchical levels.

In this framework the areas of concentration of efforts and activities have been selected for 1986-1990. They are listed below according to their importance: (1) introduction of electronics into the national economy; (2) automation and robotization of production processes; (3) nuclear power engineering and technology; (4) new materials and industrial processes; (5) biotechnology; (6) new technology of resource exploration; (7) transportation vehicles and systems; (8) food industry; and (9) public health, industrial safety and environmental protection.

The first four areas will account in the coming five years for over half (54.8 percent) of the allocations for the entire program. The funds channeled into them will amount to 393.3 billion zlotys, while the next two areas will receive just 20.3 percent of total allocations, or 186.3 billion zlotys.

The program shows that the focus of research and development efforts will be on introduction of electronics into the national economy and the discovery and development of new materials and industrial processes. The first of these areas is to receive for its development 171.6 billion zlotys, while even more has been earmarked for the second one (184.8 billion zlotys).

Both these spheres deserve more attention. Electronics and new materials combined with miniaturization are the epitome of modern technology. All competition centers around these issues, and success in this race promises the individuals, groups and nations a place among world leaders. What specific goals are set by the scientific and technical development program for 1986-1990 in these two areas? In the area of electronics a modest but difficult task has been set of reducing the technological gap separating Poland from the world's industry.

Practical introduction of research results in this area will yield, according to the program, a capacity for producing in 1990 more than 60 million LSI integrated circuits in a nomenclature of about 400 types; producing, starting from 1988 30,000 to 50,000 professional microcomputers annually; starting the production of 30-, 120- and 480-line fiberoptic cables. The catalogue of the Polish electronic industry is expected by the late 1980's to include modern products, such as equipment for epitaxy with molecular binders for a formula of 0.5 m, laser disks with a gigabyte capacity and tuners for individual reception of satellite television programs and digital signal processing. There is another important point. The program calls for practical utilization of the great tradition of the Polish mathematical school and envisages launching in 1986-90 a software industry which could become a Polish export speciality. The big unknown

here is the following: what will be done in 1986-90 in terms of design, introduction, spread and exports in the sphere of electronics industry by the highly developed countries? This uncertainty underscores the high degree of risk involved in the intensive development of research in electronics.

The Committee for Science and Technological Progress has assigned in its program more than 20 percent of funds to the centrally funded research projects for the development of new materials and industrial processes. In the coming five years more than 114 projects are to be performed in this sphere. Over all, these results are expected: 750 new designs, 569 new industrial processes and 795 new materials.

The full realization of the program "new materials and industrial processes" should lead also to highly improved purity of steel, mainly through non-furnace processing; development of steel types Kortena and Sonka of a higher strength and improved hardness and corrosion resistance; and broader use of castings of spheroidal, perlitic and high-chromium iron whose share is to grow from 4 to 15 percent by 1990. The plans for the next five years call for development of new types of foils, alloys and plates of nonferrous metals. It is estimated that the introduction of the new results into economic practice will reduce the consumption of steel per 165,000 zlotys of gross national product (an equivalent of $100,000) from 200 kg today to 175 kg in 1990 and 135 kg in 1995.

So much for metals. In the area of new materials and chemical engineering the following steps are planned, among other things: (1) expanding the raw material base of organic synthesis industry, including better utilization of coking resin and plant raw materials; (2) expanding the spectrum of additives to lubricants and fuels; (3) modernizing the existing large tonnage production of plastics; (4) increasing the nomenclature of plastics and polymer composites for the needs of electronics, engineering and equipment industries and construction; and (5) increasing the proportion of domestic raw materials and secondary materials in the textiles industry.

I have described these two spheres of development planning in some detail to provide a clearer picture for myself and the readers concerning the funds allocated for these purposes. It follows from the general program of scientific and technological development between 1986 and 1990, judging by the proportions of allocations to the individual spheres, that the restructuring of the national economy in this sense has one new dimension: the spread of electronics. The priorities in the other spheres remain basically unchanged compared with the preferences and hierarchies of previous years.

International Cooperation

These development preferences have two sources. The first stems from the acknowledgment by the center of the existence of the particular conditions of the development of the national economy. The economic management by

force of inertia pursues a traditional course and does not see the possibility of a daring restructuring. The development program of science and technology brings this to light in its interpretation of priorities.

The other reason is Poland's international undertakings, which are in the field of science and engineering, defined on the one hand by the "Comprehensive Program of Scientific and Technological Progress of CEMA Member Nations up to the Year 2000," signed by premiers of the member governments on 18 Dec 1985, and, on the other hand, the "Long-Term Polish-Soviet Comprehensive Program of Scientific and Technological Progress," signed by the chairmen of the Committees of Science and Technology of the USSR and the Committee for Science and Technological Progress at the Council of Ministers on 19 Oct 1985.

The former program calls for the development of cooperation in five areas: introduction of electronics into the economy (34 projects), including the development of a new generation of supercomputers, making use of the principles of artificial intelligence; comprehensive automation (13 projects), including the work on a flexible production management system; accelerated development of power industry (17 projects), including the improvement and expansion of nuclear power plants; new materials and industrial processes of manufacturing and processing (10 projects), including the work on industrial production of composite ceramics, amorphous and microcrystalline materials with unique properties, semiconductors, etc.; and development of biotechnology (19 projects), including work on new biologically active substances and products for food and chemical industries.

The second of these programs (the Polish-Soviet bilateral cooperation) also plans joint work in seven priority areas (introduction of electronics into the economy; comprehensive automation; power production; new materials; biotechnology; development of machine industry; and production of high-quality consumer goods).

We see that the main goals of the scientific and technological progress stated in the program for the development of science and technology in the years 1986-90 correspond to the goals set by the bilateral Polish-Soviet program and the comprehensive program of CEMA member nations. It is also obvious that besides attempts at moving in the same direction of development, little room is left for differentiation of interests in case of unexpected scientific or technical discoveries which the future may bring and which in the world of science and technology are unpredictable, since plans and intentions are kept secret.

Licenses

One of the forms of obtaining scientific and engineering results will be by purchasing licenses. In contrast to the 1970's, the program of scientific and technologicalk development sets out the guiding principles for license purchasing. It is especially emphasized that license transactions should

Areas of Allocation of Funds From the Central Research and Development Fund

Item	Description	Spending in 1986-1990 bill. zl	%
	Central Research and Development Fund	774	100.0
1	Central Programs of Basic Research	100	12.9
2	Central Research and Development Programs	450	59.4
3	Government contracts (R&D spending)	52	6.7
4	Intraministerial programs	85	11.0
5	General technological activities	58	7.5
6	Reserves of the Presidium of Committee for Science and Technological Progress	19	2.5

Technological and Quantitative Effects of New Designs, Products, Production Processes and Materials as a Result of Implementation of the Central Research and Development Program and Government Research Contracts According to Spending Concentration Areas

Area nos.	Description	New designs of products	New industrial processes	New materials
	Total	4,523	2,122	1,255
	including:			
1	Introduction of electronics into the national economy	891	282	33
2	Automation and robotization of producton processes	640	126	20
3	Nuclear power production & technology	846	81	33
4	New materials & industrial processes	750	569	795
5	Biotechnology	2	24	39
6	New technologies for exploration of mineral resources	372	171	27
7	Transportation vehicles & systems	205	73	20
8	Food industries	586	333	132
9	Health care, industry safety & environmental protection	168	431	138
10	Other areas	63	32	18

be closely correlated with the assignments defined in the National Socio-economic Plan, especially as regards structural changes and improved efficiency in utilization of fuel, materials and power. It is further stated that license purchases should be limited exclusively to the fields where it would be not cost-effective or impossible to develop a domestic substitute for the license to be purchased.

There are two other postulates in the license policy. Preferences will be given to the purchase of licenses concerning technical knowledge or manufacturing knowhow that improves the productivity and quality of production utilizing the existing production capacities and space, while limiting the import of capital and materials. As a condition for license purchases the existence of the appropriate research-and-development facilities for putting the purchased license into effect will be required. An important principle in this area will be the formulation of plans for the development of purchase licenses. An important principle in this area will be the formulation of assignments for development of the uses of licenses purchased in the framework of central programs of research and development and government contracts.

The program specifies, in addition, that in the formulation of license and patent purchase policies multilateral cooperation of socialist countries will play an important role, although the interests of Poland's science administration agency are not limited to these countries alone. The transfer of technology and industrial knowhow will be organized in all geographical areas. Major efforts will be invested in exchange of scientific and technical thoughts with countries of Western Europe, including Austria, Finland, West Germany, Italy, France and Spain, and many developing nations such as India, Mexico, Brazil and Argentina.

This is how it is described in the program. The current practices and conditions and, in particular, the situation in the economy and the national debt impose here strict limits. It is good that the program of scientific and technical development pays attention to this fact and lists some of the important limitations which may substantially or drastically change the prospects for reaching these goals unless they are eliminated or at least reduced in their impact.

First of all, this concerns the syndrome of empty foreign currency accounts. This affects, of course, not only the general possibilities of the nation but also what is available to individual scientists. The program emphasizes, for example, that the practical impossibility of meeting the basic currency needs of research and development and production enterprises implementing technological progress leads to the situation where the results largely depend on the nation's success in foreign trade. The national debt also creates bottlenecks in license policies. The nation's balance of payments introduces limitations even today, at the beginning of the implementation of the program. For the first years of the five-year period between 1986 and 1990, the plan, therefore, assumes that the purchase of licenses will only be possible in specially justified instances.

A similar situation is mentioned in the program in the sphere of introduction of innovations, since the necessity of reducing the investments rules out the possibility of implementing a larger number of new developments involving substantial initial outlays.

Another problem also presents an obstacle or barrier which cannot be surmounted soon and which will significantly affect the capability of reaching the goals spelled out in the program. This is the problem of manpower potential of scientific and development facilities.

The program assumes a strengthening of the manpower potential of science and development, including the staffing of research units in the industry (laboratories, design bureaus, experimental units, industrial process development bureaus, etc.). In 1985 the total number of these outfits was 727. Their total employment was about 50,000, including 1210 research and development scientists and 16,500 engineers and technicians.

The authors of the program, some of whom are active in research and development, note, for example, some changes in employment patterns observed in the past 10 years. In scientific research and development units in the industry a substantial reduction of employment and unfavorable rotation in its structure has been observed. For example, compared with 1975 the employment of research and development units has dropped by 33 percent; in particular, in research units at industrial enterprises this decline equalled 64 percent, while the employment of research and development scientists shrunk by 15 percent. Especially disconcerting in view of the innovation plans in the new program is the massive reductions of employment in research units at enterprises.

Funds and Costs

What are the sources of financing for the program of scientific and technical development in 1986-90? It should be stressed here that the plans call for a significant increase of funds invested in the development of science and technology. By 1990 spending will rise to 300.8 billion zlotys (in 1984 prices), rising above the level of 1985 by 130 percent. The main flow of these funds will be directed into research and development (in 1990, 252.9 billion zlotys). The balance of the money will go into support of industrial introduction activities.

Financing of the program of scientific and technological development will come from two sources: (1) budget supports and (2) contributions by enterprises. The latter will be the main source of financing of the program, including the contributions by enterprises to the Central Fund for Scientific and Technological Progress. As concerns the budget subsidies, they are expected to be proportional to the growth of the gross national product and will provide as a supplement to the revenues of the Central Fund for Scientific and Technological Progress.

For a clarification it should be added that the Central Fund for Scientific and Technological Progress is to be divided into: the Central Fund for Research and Development and the Central Fund for Support of Industrial Introduction. The program stipulates that, in view of the importance of the latter fund, government innovation policy provides for substantial growth of accumula- tions in this fund: from 11.4 billion zlotys in 1986 to 38.2 billion zlotys in 1990, or a growth of 235 percent.

It follows from the program of scientific and technological development in 1986-90 described in these lines that its complete implementation will be possible provided favorable internal and external conditions. There are quite a few hurdles and various limitations, and the research priorities that have been set are faced with numerous practical difficulties. The centralization of the program, which to my mind is excessive, and its substantive contents seem to suggest that at least as far as the mechanisms and tools of implementation are concerned all will not unfold as envisioned in its concept. One is led to this conclusion by past experience.

9922
CSO: 2602/16

POZNAN FAIR EXHIBITS DESCRIBED, EVALUATED

Warsaw RADIOELEKTRONIK in Polish No 11, Nov 86 pp 29-31

[Article by A.W., special to RADIOELEKTRONIK: "Notes From the 58th International Fair in Poznan"]

[Text] The 58th Poznan International Fair [PIF] took place on 7-15 Jun 1986. The slogan of the fair was "Economical Use of Power and Materials in Production!" This affected the choice of exhibits presented by Polish firms as likely to be of interest to foreign consumers. This was also the basic premise in the exhibitions of the results of Polish science represented at the 58th PIF.

Polish exhibits belonged mainly to industries and products promising for export. Of the total exhibition space at the fair, 58 percent was occupied by 1750 Polish exhibitors. Some 15 percent of the exhibition space was taken by 11 socialist nations (excluding Poland), with the remaining 27 percent being taken up by numerous firms from capitalist countries. A total of 3800 exhibitors from 39 countries displayed their products at the 58th PIF. The entire exhibition space was utilized; the amount of space reserved by many foreign firms had to be limited because of excessive demand.

The fair as a whole left a good impression. It was obvious that the Poznan Fair has returned to its past glory.

In 1986 the Poznan Fair occurred at an important juncture for Poland's economy: We have entered the first year of the current five-year-plan period, which is of a great importance for the country's future economic and technological development.

The exhibits presented by Polish organizations were arranged by industries, while foreign exhibits were arranged according to countries.

Information on some of the foreign expositions is given below.

The exhibitors from the Soviet Union occupied a beautiful pavilion and the adjacent open areas. The exposition was marked by a large diversity. Machines and electrical engineering products, measurement and monitoring

equipment and optical and geodetic instruments were predominant. Automobiles known for durability were also exhibited, including the new Lada model, with an entirely remodeled body. A number of interior design products were also presented (furniture, carpets, decorative glass, etc.). A large selection of household electronic appliances was shown (refrigerators, vacuum cleaners, food processors, blenders, etc.). Consumer electronics accounted for a small fragment of the exposition. General attention was attracted by the modern color television Vityaz--a desktop television with a medium-sized screen, furnished with semiconductor components (weight about 10 kg, energy consumption from powerline about 80 W). It is regrettable that the Polish electronic industry does not manufacture a similar color television for the general consumer.

The GDR pavilion offered a remarkable clarity of presentation. In a large rectangular and tall pavilion, the exhibits lined the walls and formed a line in the middle of the hall. There were no partitions or obstructions, allowing the visitors to see at a glance what might be of interest to them. The largest exhibit in the pavilion was a mechanical metal casting plant. In addition, there were stands representing the various specialized industries of the GDR, such as electronic and kitchen household appliances, plastic products, musical instruments, toys, etc. Products of the computer firm Robotron occupied a large area, staffed by skilled guides. The RFT Integrated Factory presented effectively a complete catalogue of electronic equipment for the modern home. Electronic musical instruments (organs, pianolas and synthesizers) and mixers and sound amplifiers for bands of light music were also presented.

In the pavilions of Czechoslovakia, Hungary, Rumania, Bulgaria and Yugoslavia, one could see well-prepared expositions of the broad lists of products of these countries. Audiovisual equipment was also seen in all of these pavilions in a broad or modest presentation. The products, generally made well and at a high technological level, were mostly unremarkable.

The largest exhibitor among foreign countries was FRG. In two large pavilions and on open areas, amounting to almost 10 percent of the exhibition space of the fair, several hundred West German firms displayed their wares or trade offerings. The leading exhibitors were obviously large firms in heavy engineering, electrical engineering and chemical industries. One was struck by the large number of measurement instruments for industry, including computerized equipment. The penetration of electronics into all spheres of industry, science and services was obvious.

Representatives of Austria and Britain offered a diverse exposition, somewhat scattered throughout the premises of the fair. Here, too, important industries and many famous firms were represented. To conclude this general overview of the exhibits at 58th Poznan Fair, we should emphasize the surprising number of cars present. Mercedes, BMW, Fiat, Peugeot, Japanese car-makers and all people's democracies brought their passenger cars, trucks, specialized automobiles, etc. Polish automobile industry displayed the full spectrum of its capacity.

After this general impression of the 58th Poznan Fair, which was an interesting commercial event, we proceed to a brief review of the Polish exposition of consumer electronic products.

Consumer electronics were shown in the pavilion (with a spire) opposite the main entrance. The favorable location and the live interest in audiovisual equipment among visitors were responsible for the fact that the exhibits were surrounded by crowds from the first day of the fair to the last. As in the other industries, the exhibition of consumer electronics placed emphasis on export, but at the same time offered a display of the products manufactured by various factories. Many of these products are known to the readers of RADIOELEKTRONIK, which has published descriptions and information about them. For this reason, we will describe only some of the products or prototypes introduced into production.

Dior Radio Factory

Interest was attracted to the new Slim-Line hi-fi system, consisting of a broadband tuner AS-640, amplifier WS-440, with a power consumption of 2 x 40 W, and cassette recorder MDS-440, which can use all kinds of tapes. The tape recorder includes a Dolby noise suppression unit and conforms to world standards of high-fidelity equipment.

Those fond of miniaturization may be interested in the new product, measuring 350 x 70 x 200 mm, and consisting of an AS-250 tuner, WS-350 amplifier with a power of 2 x 35 W and cassette tape recorder MDS-450. This recorder is also adapted to all kinds of tapes and has a noise suppressing unit. Products currently manufactured and sold in stores included the following: cabinet high-fidelity system (AS-630, WS-430, MDS-430), Tosca amplifier tuners (AWS-303) and Aida (AWS-103), radioreceivers Taraban 3 (R-510) and Snieznik (R-502) and others. A large number of car radios and car radios with cassette players were also shown. The best of these was the Wiraz 5 (RPS-604).

Eltra Radio Factory

Known primarily for its good portable radios, Eltra presented a large number of new or modernized models.

Among the new products intended also for export were portable radio sets Liza (R-203) and Ania (R-613). These are battery-powered radios with an ultra-shortwave and shortwave band. The former, in addition, has a long and medium band and weighs only 350 g. The latter also has shortwave and a rectifying built-in adapter for AC outlet; it weighs 650 g.

The portable high-class radio receiver Maria (R-801) is popular. This is a 10-band AC/DC receiver with an output of 1 W/1.7 W, weighing 2400 g. The unit features quality reception on shortwave (seven bands) due to the double frequency modulation, stretched dials and high sensitivity (40 µV). Other features include the elegant box, large and legible dials and two needle

indicators (tuning and battery voltage, and ultra-shortwave frequency). A similar, somewhat more modest, unit is the Sabina (R-610), with equal parameters in shortwave band, but of a lower output power and more modest appearance.

The T9050-z tuner with microprocessor is quite innovative. It has no rotating knobs but about a dozen buttons. The unit features a developed system of memory of stations and tuning positions, automatic or manual station selection, indication of the frequencies of signal received, etc. Unfortunately, it will not go into production before 1988 because of the short supply of certain components.

In addition, Eltra presented some of its products already known such as the T-8010, T-8020 and T-9010 tuners and a whole range of portable radios (Alicja, Lena, Donata, Julia and Klaudia). A special line of Eltra's products are electronic musical instruments, including the Estrada 108 and Mikser 601 organs, automatic percussion device Rytm-16 and active speaker units Eltron-30J and Eltron-50JP.

M. Kasprzak Radio Plant

This factory is famous for its wide selection of tape recorders and radio cassette recorders. The parameters, the consumer quality and the appearance of these units continue to be improved. Currently the products manufactured by the factory include: battery-powered radio cassette players RM-121 and RM-132, AC/DC radio cassette players RN-222, RMS303, RMS451 and RMS475, cassette recorders M7010, M7012, M7020, M8010, M8040, M8012, M8015, M9010, M9100, M9050 and M9201 (two-cassette system) and amplifier-tuners AT9010 and AT9100. A new item is a Walkman-type cassette player (M10) with an output power of 2 x 100 mW.

Radmor Radio Enterprise

The factory concentrates its consumer manufacturing on quality equipment produced in small numbers. Presented at the exhibition were amplifier tuners 5411 and 5412 for ultra-shortwave and microwave bands, with a power output of 2 x 45 W, tuners AM5421 and 5422 for long and medium waves and seven shortwave bands, as well as the previously known image equalizer 5471. The tuners will appear on domestic markets in 1987.

Lodz Radio Factory Fonica

This plant is the only producer of electronic recordplayers. The record-player GS-420 is a high-fidelity direct-drive unit and which has a pickup with an oval-shaped diamond needle. The recordplayer GS-431 with the pickup MF-100 has a belt drive and just slightly inferior features. The popular electric recordplayer is represented by the G-902fs, with a ceramic pickup UF50.

Separate electrical recordplayers with amplifiers with power output of 2 x 5 W are represented by the WG-900 and GWS-106 systems. In addition,

Fonica manufactures players and amplifiers for cabinet-mounted electro-acoustic systems. These include PW-8010 amplifiers, with a power output of 2 x 15 W, and PW-9010 amplifiers, with an output of 2 x 25 W. Both belong to the extra-flat family and are just 57 mm tall. Obviously, all recordplayer manufacturers are interested in digital disk players. This is a difficult problem, because it involves the import of a large number of special assemblies and purchase of licenses from Philips. Fonica is conducting negotiations in this area with the related enterprises in socialist countries.

A special product of the factory is the discotheque system ZMS-42, manufactured jointly with the Tonsil plant. The system consists of a recordplaying turntable, cassette player, amplifiers, four speaker assemblies (10-speaker units) and a lighting system with several dozen lamps and reflectors. The systems are intended for export. As the output is increased, they will also become available for domestic markets.

Unitra-Unitech

Production and service operations of this enterprise, headquartered in Belogard, with several branches in other cities, are little known. The plants produce amplifiers with a power output of 2 x 100 W, type RWM-1505, and broadcast station service amplifiers with an output from 200 to 600 W and an output voltage of 50 to 100 V. Other products include mixers for several channels and other auxiliary equipment.

The enterprise offers all kinds of services in design, assembly of package systems and oversight of installation of radio broadcast stations and public address systems. It also produces all kinds of connectors, sockets, plugs and switches.

Tonsil Speaker Manufacturing Factory

The factory exhibited a large selection of speaker systems, namely, the well known Altus family of equipment, speaker systems of types ZG30C22 and ZG60C22 for high-fidelity equipment and other products. A novelty was the new family of three-track speaker systems, which were awarded the gold medal; it consists of the ZgB70-8-84, ZgB80-8-84 and ZgB110-8-84. The three units have a rated power of 70, 80 and 110 W and have open cabinets with modernized speakers with improved parameters. All the units are equipped with adaptive regulators of characteristics in medium- and high-tone ranges. Other products that deserve attention are car speaker systems with rated output powers of 10, 20 and 30 W. These are two-unit systems to be installed at the back of the car. Tonsil is also the only Polish producer of microphones and headphones, which will be described in a separate article.

One can state with satisfaction that, although Polish consumer electronics cannot compete with famous Western and Japanese firms, it manufactures quality products that can meet the demands of domestic markets and interested foreign importers. All electronics manufacturers experience difficulties with components and materials, slowing down the output of the end product.

There is a clear need for placing special emphasis on efforts to supply the electronics industry with materials and assemblies.

Successes achieved at the fair by other branches of the electronics industry should also be noted.

A gold medal was award to the 16-bit professional personal computer Mazowia 1016, manufactured by Mikrokomputery Enterprises in Warsaw. It is compatible with the IBM PC/XT. The Mazowia 1016 is intended for various applications:

--data computations, collection and processing;

--computations for science and engineering;

--word processing;

--graphics work;

--program development and implementation; and

--support to production management.

The top title "Mister Export '86" was awarded to CAMAC system equipment, manufactured for years by POLON Integrated Enterprises of Nuclear Equipment in Warsaw. The title "Vice Mister of Export '86" was awarded to kinescope A56-701, produced by Color Kinescope Unitra-Polcolor Enterprises in Piaseczno. Specially mentioned in the group of contenders for the title of "Junior Export" were:

--the D-100 mosaic printer made by Precision Mechanics Enterprise MERA in Blon; and

--revolving and tumble switches from Radio Factory Eltra in Bydgoszcz.

The fact that Poland still is not an interesting market for electronic equipment and appliances is illustrated by the modest representation of major Western producers at the fair. Consumer electronics were virtually not exhibited, although professional equipment, mainly instrumentation, was presented by famous firms, such as Bruel-Kjaar, Hewlett-Packard, Marconi, Philips, Rohde-Schwarz, Schlumberger, Solartron, Tektronix and others.

Computers were presented in a limited range by a handful of Western firms, headed by IBM.

9922
CSO: 2602/24

COMPLAINTS OF POLISH MARINE ENGINEERS NOTED

Gdansk BUDOWNICTWO OKRETOWE in Polish No 12, Dec 86 pp 499-504

[Transcript of a discussion among 12 shipbuilding experts and managers held in the editorial offices of BUDOWNICTWO OKRETOWE and moderated by the journal's editors, Zbigniew Grzywaczewski and Andrzej Golebiowski: "A Crisis in the Engineer's Profession: Who Will Build Ships?"; date not specified; the first paragraph is an editorial introduction]

[Text] Participants in the discussion of the disconcerting deterioration in the position of shipbuilding engineers as a profession held at the editorial offices of BUDOWNICTWO OKRETOWE were Marian Banacki, MS (Eng), director of the Hydromechanics Department of the Shipbuilding Technology Center at Gdansk; Konrad Banecki, engineer, chief of the design and development bureau of the Gdansk Shipyard; Leszek Bednarski, MS (Eng), senior lecturer at the Shipbuilding Institute of Szczecin Polytechnic and member of the board of NOT [Chief Technical Organization]; docent Josef Burzynski, DSc (Eng), director of the Shipbuilding Institute of Gdansk Polytechnic; Marian Kollewski, MS (Eng), technical chief of the Association of Shipbuilding Enterprises at Gdansk; Jaroslaw Kula, senior student at the Shipbuilding Institute of Gdansk Polytechnic; Janusz Puchalski, engineer, director of Radunia Repair Shipyard at Gdansk; Antoni Rylke, MS (Eng), chief designer at the design and development bureau of Paris Commune Shipyards at Gdynia; Andrzej Sliwczynski, MS (Eng), general project manager at the design and development bureau of Szczecin Shipyards; and Witold Zylicz, MSc (Eng), chief project manager at the design and development bureau of Lenin Shipyard at Gdansk and an editor of BUDOWNICTWO OKRETOWE. The editorial board was represented by Zbigniew Grzywaczewski and Andrzej Golebiowski; the latter prepared the text of the discussion for publication.

[Question] Developments in the last few years in the shipbuilding industry and in schools training shipbuilding engineers fully justify this dramatic question: Who will design and build ships in Poland five, 10 or 20 years from now? The number of college applicants has dropped. Fewer people graduate, and of these only a small number take up jobs in the industry. Many young, capable and enterprising engineers have emigrated abroad in quest for a better chance in life. The number of engineers in design bureaus, shipyards and manufacturing enterprises is declining at a disquieting pace. The most

experienced professionals have left--into early retirement or for other jobs, which often have nothing to do with their professional career, but provide a remuneration that an engineer deserves. We have come to a point where this can be obtained only by putting the college diploma in the desk drawer and selling produce or taking up the job of a machine operator.

Those remaining loyal to their engineering vocation are in a way "penalized," for the social prestige of an engineer's profession is clearly dwindling. The situation concerns not only shipbuilding. The number of applicants at technical colleges in all areas has declined, except for electronics, which is fashionable and at least theoretically offers a chance of finding an attractive job abroad or "working for oneself" in Poland. Recently, for example, the rector of Silesian Polytechnic, in a published article, spoke of the complete lack of interest among the most capable graduates in staying on for postgraduate studies and of the failure to fulfill the enrollment plan in basic fields, such as electrical and chemical engineering.

In the future, this situation may give rise to another high barrier separating Poland for developed nations, which are currently going through a period of unusually accelerated technological progress; this barrier will be difficult to surmount. Without well-educated technological manpower, all talk of catching up with the leading world nations or even halting the relative cultural degradation of Poland will be futile.

It is indeed high time to start sounding the alarm. This is justified by the current situation and its predictable consequences. We would like for you to describe the situation with special reference to the shipbuilding industry, the only industry in Poland which in the past held an assured leading position in the world. Now it can lose it ...

[Answer] (J. Burzynski) The question as to who will build ships can be answered, for instance, by the number of applicants admitted to the Shipbuilding Institute of Gdansk Polytechnic over the past few years and the number of graduates. They can be given in the form of a table:

Year	Applicants	Number admitted	Spaces available	Graduated	Full-time students
1976	238	83	No data	142	97
1977	170	78	80	119	76
1978	138	77+13	90	139	101
1979	100	61+29	90	90	70
1980	150	85+ 5	90	98	82
1981	117	60	60	110	67
1982	90	55	50	81	56
1983	101	77	80	71	42
1984	98	72+27	80	62	42
1985	73	50+24	80	63	41
1986	58	40+25	65	31	20

As can be seen from the table, between 1978-81 and 1984-86 the number of first-year applicants admitted to the college had to be supplemented by applicants who passed entrance examinations but were not admitted to other departments of the polytechnic because of a lack of spaces or could not get into the Higher Maritime School (indicated in the table by the numbers added with a plus sign). The drop in the number of applicants and graduates answers the question who will build ships. It should be remembered that this year's graduates began college in 1980-81. But how many will graduate among those admitted this year?

[Answer] (L. Bednarski) Equally indicative are the numbers for the Shipbuilding Institute of Szczecin Polytechnic (see table).

Year	Number admitted	Number of graduates
1980	63	42
1981	59	39
1982	40	52
1983	41	46
1984	31	28
1985	30	29
1986	40	-

The figure of this year's gradutes is missing, because none of them completed their diploma project before vacations. All these numbers, of course, refer to Polish students. We see that there are fewer admissions and fewer graduates. It should also be added that in the past 10 years just five gradutes received diplomas with excellent grades.

[Answer] (J. Burzynski) It is true that we succeed to fill out the quota by "borrowing" from other departments or schools, but it should be noted that in this situation we have no selection. This means that the number of dropouts in the course of study will be larger.

[Question] This is obvious even from a comparison of the number of graduates and the corresponding number of admissions five or six years before. The percentage of graduating students is steadily declining ...

[Answer] (J. Burzynski) We should also consider that the students "kicked over" from other departments will try to return to those departments in the course of study. Maybe this is not true of all, but one can certainly not say that they decided to work in the shipbuilding industry or, more broadly, the maritime economy of their own free will.

[Question] What can be said about the timeliness of graduation? Do you observe a phenomenon of purposeful extension of the course of study to move back the point of taking up a professional job?

[Answer] (J. Burzynski) Educational regulations that went into effect two years ago are strict. All regulations, however, before 1984 allowed extending the period of study under various pretexts, and, indeed, the timeliness of graduation was quite low. At most, 15-20 percent of students graduated after 5.5 years. These were--pardon the expression--diligent dupes who suffered for their honesty and reliability, for their application to study. Because, of course, it simply doesn't pay to graduate ....

[Question] What can the repesentatives of industry say about that? How is the demand for a graduate formed? What is their situation?

[Answer] (M. Kotlewski) Before answering this question, I would like to ask the director of the Shipbuilding Institute what actions has the school undertaken in seaboard provinces and across the country to promote the shipbuilding industry, to encourage young people to take up study at Gdansk Polytechnic and Szczecin Polytechnic in the area of shipbuilding? I have seen in the press advertisements by shipyards inviting workers; I have heard on the radio announcements by shipyards and have seen certain activities on television, but I have never noticed any initiative on the part of the polytechnics. The absence of such actions is a fundamental cause of the situation just outlined by the director of the Shipbuilding Institute.

[Answer] (J. Burzynski) I will answer your question with a question: And what has been done by the shipbuilding industry to become attractive as an engineer's career?!

[Question] They published ads ...

[Answer] (J. Burzynski) A course of shipbuilding takes up 5.5 years, or a maximum--according to regulation--6.5 years. Then one works as an engineer for at least 30 years. A young person chooses a specialty not because he is attracted to a course of study but because he wants to work in a certain profession. If the shipbuilding industry becomes attractive, there will be no shortage of college applicants. One can ask: What is it that the dean of the architecture department is doing that he has five applicants for each opening? What is done by the rector of the medical academy that they have so many applicants? They don't lift a finger. They are not advertising at all.

At the Silesian Polytechnical Institute and at the Mining and Metallurgical Academy, there is also a crisis in enrollment for all mechanical departments. But mining is an exception! Is it an accident?

After observing the situation deteriorate for years, this year I decided to prepare a questionnaire. We asked graduates of the past 10 years questions about their study and work. Among others, it included a question on reasons for taking up study in shipbuilding and work in this industry. The data of these questionnaires are currently being processed, but even a cursory glance at them points up two reasons: a romantic love for the sea and development of shipbuilding industry. "I believed that it would offer me a field to show what I could do and also a good situation in life," they write. So we see that

money is also important. No question about that! And not advertisement by the Shipbuilding Institute; not advertisement by schools.

In the meantime, the Paris Commune Shipyards on 20 March 1986 sent us a request for five graduates, advancing scholarships of 2400 zlotys each. It should be added that the average government scholarship ranges from 4000 to 7000 and currently even up to 13,800 zlotys in certain cases. Further--in case of employment after graduation--shipyards offered a salary during probation of 8000 and after probation 9000 zlotys and a promise of an apartment. Nobody accepted that scholarship. Are you surprised? Have I answered your question?

[Answer] (M. Kotlewski) Thank you very much. I still believe that one should not merely look at the other party but do something on their own. I still believe that advertisement of the school department to young people would yield certain results.

[Question] That would be advertisement not supported by facts, not quite fair ...

[Answer] (K. Banecki) Are you aware, Dr. Burzynski, where your graduates go?

[Answer] (J. Burzynski) As I have said, the results of the questionnaire are still being processed. A preliminary review suggests that about 15 percent after graduation do not go into shipbuilding in the broad sense of the word. A large proportion go to various cooperatives, and there are even cases of taking up a teacher's job in village schools, because there they can get housing. Some work at electric power stations or at cement factories somewhere in the south of the country.

[Question] After the results of this interesting questionnaire are available, we will try to publish them in BUDOWNICTWO OKRETOWE.

[Answer] (L. Bednarski) We are talking about the crisis of the engineering profession. Is it justified to use this term? Recently, I asked one of our new graduates about his plans. He said he was returning home to the Lublin area, where his father promised to give him half a hectare of a tobacco plantation. "But I know that you liked shipbuilding and that you were involved in studies on which, after all, you spent five years of strenous effort," I said. "Can you tell me what are your dreams," I asked with hope. But his answer was, "Two hectares of a cherry orchard, because that would bring twice as much as tobacco."

So the romantic youngsters grew up to be quite practical people. Those who are 50 today obviously had a chance to satisfy their romanticism in their professional careers. The younger generation of romantics have no such chance.

The crisis of shipbuilder's profession has, to my mind, at least two aspects. One is the quality of training of graduates preparing them to be good

engineers with career aspirations, expanding constantly their knowledge, aggressive in their attitude to new technology, wishing to change it and have an influence on their profession and those around them. I believe that in this area, too, we can speak of a crisis. Another matter is the question of whether the shipbuilding industry offers engineers conditions where their professional aspirations can be met. We know that in the last five years the shipbuilding industry fell into decay with all the related consequences. So when we answer to the reproach that we are not encouraging young people to take up shipbuilding studies, that the school is not advertising, we must say that we have to be honest with them. We could obviously "play up" the modern attractive technology which in recent years also appeared in world shipbuilding. But we have no confirmation from the industry exactly what these young people can expect, that they will be accepted and that they will receive career opportunities. In this situation, schools will certainly be cautious in recruiting students for engineering studies, because they want to be honest with them.

Concerning the first aspect of the crisis--namely, the change in the professional profile of an engineer--this is certainly nothing new. Twenty years ago, Professor Leszek Pasieczny noted in his study of the situation with career engineers that hardly 10 percent of managers encouraged their engineers to read foreign special literature at the time. In the past few years, access to these publications in Poland became even more limited when such banal matters as making a xerox copy of a borrowed book becomes a problem for well-known reasons ...

[Question] The readership of the Polish technical press has also dramatically declined recently, as has been felt, in particular, by BUDOWNICTWO OKRETOWE and most such specialized journals. Individual subscribers are an exception ...

[Answer] (L. Bednarski) The decline of readership does not necessarily indicate a lack of interest. When an assistant instructor at a college makes 9300 zlotys monthly, one can hardly expect him to subscribe to a periodical for 130 zlotys! And yet a young engineer ought to build up a professional library from scratch.

[Answer] (V. Zylicz) I suggest that we first discuss the essence of the crisis and then start considering its sources ...

[Answer] (K. Banecki) Until 1980, employment at the design and development bureau of Gdansk Shipyards was stable, and numbered about 740 individuals. Since then, the number dropped to 612. The number of productive employees was reduced from 635 to about 540. In the meantime, the staff of the shipyards has also been reduced, so that percentagewise employment at the bureau has practically remained the same. We can also say that the bureau still copes with meeting the current needs of the shipyards, although with difficulty. I am saying "still," because if in the future there is a breakdown of production at the shipyards it will certainly be caused by a shortage of engineers. This is true of the entire shipbuilding industry. We should remember that it takes

at least 10 years to train a good engineer. In the meantime, he must be trained, guided, invested in. It is impossible to make up rapidly for losses in this area. The crisis facing us is perhaps not yet in full view, but it will certainly become obvious dramatically in the nearest future. Even today, some of the sections at our bureau have an employment diminished to a critical level, below which they will be incapable of fulfilling their tasks. The design workload of sections is so large that we cannot work on projects concerned with technological progress. The participation of the bureau in projects conducted in the framework of the Central Research and Development Plan under the guidance of Shipbuilding Technology Center is infinitesimal. Our personnel is growing old. Two hundred and seventy-six employees have worked for more than 20 years; 451 for more than 10 years. In the meantime, there is hardly any influx of young people to speak of. This is graphically illustrated by the new hirings of engineers and technicians at the design and development bureau of the Gdansk Shipyards in 1980:

	Engineers hired		Technicians hired	
Year	Total	On probation	Total	On probation
1980	18	12	8	3
1981	3	2	-	-
1982	4	2	5	2
1983	1	-	2	-
1984	-	-	-	-
1985	12	1	3	2
1986	12	4	5	2

One is particularly worried by the few hirings of young engineers. In the past four years, hardly a single engineer was hired on probation. This situation is similar throughout the shipyards. In 1981 12 engineers were hired on probation; in 1982 15; in 1983 14; in 1984 just 2; and in 1985 8. A certain number of technicians and even engineers leave shipyards to take up a menial job.

Shipyards are constantly advertising in the papers offering jobs for engineers. Thanks to the construction of single-family homes and apartments in factory housing, we are capable of helping young people much better than anywhere else to get housing. But still nobody comes.

The failure to understand the importance of the scientific and technological base for national development resulted in a completely false wage policy, which (in addition to errors in manpower policies and in education) is halting scientific and technological progress. Starting from the 1960's, we have witnessed a decline of the wages of engineers and technicians compared with

the wages of workers. This is continuing today. An engineer on probation with us can earn 8000 zlotys plus a 50-percent bonus. We are reducing the probation period to 3 months in order to be able to provide 12,000 to 13,000 zlotys as the basic pay. This is a level to which the total salary can come up. These are certainly wages, although not lower than in an average enterprise elsewhere. If, however, a good engineer leaves us to repair shoes, obviously, it is not worth it for him.

[Question] So the problem is wages!

[Answer] (K. Banecki) Of course! But not only this. It is a combination of many elements. Dr. Burzynski will have no applicants if, for example, in the families--especially in the seaboard provinces--there will be no favorable climate for the shipbuilding industry, if the people do not think that working at shipyards is a good thing and that it is worthwhile to be an engineer.

[Answer] (A. Sliwczynski) In early 1986, the design and development bureau of the Szczecin Shipyards employed 624 professionals and was the largest such bureau in the Polish shipbuilding industry. Last year, 73 work contracts were discontinued. Basically, we were capable of "patching over" this loss, but one can say that only in quantitative terms, because most experienced people left. This year, 48 people have already quit during less than nine months, but only 24 new people were hired, and more notices have been submitted. This situation is becoming dramatic, because all attempts at hiring new people have been futile. We have many times advertised in the press, conducted interviews with third- and fourth-year students at Szczecin Polytechnical Institute. We have mailed to all graduates personal invitations to work for us. Not a single response! And this is not surprising. It is true that what we are offering for new engineers is somewhat better than at Gdansk--namely, 9900 zlotys, 11,100 after probation.

However, I would warn against oversimplifying. The matter is not limited to wages. Certainly, among career motivations they play an important role, but not always the most important one. Sometimes the most important thing is the possibility of working on new problems, a chance of working according to one's qualifications and the feeling of creating new things and new values. If in the entire industry--and not only shipbuilding--there is a degradation of the engineer's profession, there is a lack of need for innovative thinking, if it pays more to make old things than to find new ones, the basic elements of this motivation disappear. In the 1950's, an engineer ranked third or fourth in terms of social prestige. Today, certainly, this career places much lower. So the lack of applicants at technical colleges is a secondary phenomenon, and advertisement will not help. In fact, it would be unfair advertisement, because the industry at this point is incapable of offering anything attractive.

[Answer] (K. Banecki) The situation is especially dangerous for shipbuilding because there appeared a market for engineering jobs. The enterprises that are economically weaker and pay less lose. Thus, by "overbidding" shipyards can completely "dismantle" the Shipbuilding Technology Center, for example.

[Question] There are, however, quite prosperous firms which "outbid" engineers from shipyards ...

[Question] But maybe it is good that a labor market has appeared. Maybe it is an avenue for winning better conditions for engineers who deserve it. Maybe this is the best way for finding out who is deserving and who is not worth it?

[Answer] (J. Puchalski) In the ship repair industry we are employing a total of more than 350 ship engineers with similar specialties. In the next two years, we will need about 100 engineers.

I want to say that I believe that nobody has been deprived of the right to innovate. At Radunia Shipyard, which I manage, we have resolved in a most difficult time old and worrisome problems, such as conservation of ships. This was done by young and enthusiastic engineers and young economists. They proved that even at times of general disaffection one can achieve improvement of productivity. Such initiatives, as long as they satisfy a need, among other things, lead to improvement of wages not only of people directly employed in production. Nobody has been deprived of the right to such innovations. Another example: Shipworkers at our shipyards began to repair containers, and, again, it turned out that using modern technology the same group of people could increase the amount of repairs within two years by more than 2.5 times. Maybe thanks to this involvement we will soon stop sending Polish containers to be repaired in other countries. And we may even begin ourselves to earn valuable dollars by doing this work. Recently, we have begun vigorous work on regeneration of components. There is a gold mine of projects!

There are two aspects in the situation with career engineers. First is the technical and innovative aspect. As I mentioned, no one puts up obstacles in this area. The other aspect is financial. There is nothing to compete about: The differences of wages among the various enterprises, shipyards and design bureaus are not all that large, but quite dangerous is the creation of entirely new rights concerning payments in newly created cooperatives, associations and all kinds of entities, whatever their names, which are mushrooming. The danger from them affects not only the engineers, but, for instance, also a welder who can take a vacation from the shipyards, go to a cooperative shop and earn 2½ times as much, bragging that it was "no sweat." We can deal with competition among ourselves, but here we are dealing with amounts that are many times over. The absurdity resides in the fact that at a modern industrial shipyard one earns less than going to work with a toolbox. Some cooperatives making use of "borrowed" engineers and workers and thus making use of borrowed tools, therefore, have no overhead and can pay many times more. This is a problem. A shipbuilder's dream should not be a cherry orchard but the building of ships, although for a salary comparable to what the orchard owner makes.

At our shipyards, young engineers often begin work from menial jobs, such as fitters or assembly workers. Perhaps because of this they immediately earn

about 20,000. When they move to an engineer's position, their salary does not go down. For example, a graduate of Gdansk Polytechnic from 1978, who worked in succession as a shipbuilder, shipbuilder foreman and designer, is now senior foreman and earns on average 45,000. Another graduate--from the class of 1980--started as a machine assembler, then became a shipbuilder foreman and now is head of department earning 58,000. You see that the situation with wages is better with us than at other shipbuilding enterprises. These differences, however, are not all that great.

[Answer] (L. Bednarski) What innovations are we talking about?! The examples that are given are tragic. Back in 1964, 25,000-ton ships Azteca and Maya were cleaned at Szczecin Shipyards to class SA-2.5! Even then, we could clean and conserve ships that well, and the technology was completely mastered! That a group of enthusiasts can do the same thing in 1986 is only evidence that skills were lost and had to be recreated. This is not innovation. Likewise, regeneration of components is not innovation.

[Answer] (J. Puchalski) Why, then, do we have to resort to help from foreign firms?

[Answer] (L. Bednarski) Because the poorly paid engineer doesn't want to do the job as well as he did 20 years ago.

Let us compare the economic situation of two families. One has a graduate from vocational school and the other a graduate from a polytechnical institute. Compared with the first family, this latter family has lost 1½ million zlotys. This is due to the fact that while his colleagues were still in school the vocational school graduate earned at least a million. Add to this the half a million in expenses of the second family to support its student. A total of 1½ zlotys! This money must be returned. At the Shipbuilding Technology Center we believe that in the interest of career chances of young workers and students this should occur before they are 30 years old. It is wrong if higher education still drags down the financial situation of people over 30, most of whom have a child already attending first grade of elementary school! This leads to the simple conclusion that an engineer after graduation should earn twice as much as a worker. Obvioulsly, this requirement is not met. To the contrary, years ago the financial status of engineers deteriorated. The sorry results of this "policy" will have their full dramatic impact 20 or 30 years later.

Unfortunately, in Poland a person's qualifications are not perceived as representing the investment that he or she has made to acquire them. After all, in the West engineers are well paid not because they are loved but because without engineers, without their work, industry wouldn't survive. It is engineers who create technology which enables whole nations to be the cultural and economic leaders of the world. This is not realized in Poland, and this is why we are discussing how much an engineer needs to survive or whether he has a right to innovate. I would not hesitate to ask the managers of industry in Poland and to ask the workers' councils at enterprises: How can one manage industry without preparing personnel for today and for the

future?! Nobody assumes the responsibility, because the director and the chairman of the workers' council will be gone after 10 years! If it is not their responsibility, it should be the obligation of the state.

I am also concerned about the attitude toward young people. I often hear: "Let them get through. Let them show what they can. Let them fend for themselves." Nobody stresses the importance and quality of work involved in caring for seedlings if we want them to bear fruit. Instead, we are talking of how to train for 10 years and how to lead a young person so that later the entire nation will enjoy the fruit of his work as an engineer. But what if he does not get through?

[Answer] (A. Sliwczynski) Is not a matter of depriving or not depriving engineers of the right to innovate, but of the lack of need for innovation. One has only to look at certain elements of ship equipment which have been produced in Poland for many years without any change.

[Answer] (A. Rylke) The situation at the Paris Commune Shipyards is no better than at other shipyards and probably even worse, because here a large decline in output has taken place. Employment at the design and development bureau has decreased from approximately 600 to over 400 people. The decline in productivity of the shipyard has resulted in a situation where even this reduced staff of the design bureau has to do work for outside contractors to survive.

We were going to speak about shipbuilding engineers, but we are talking about the situation of engineers in general. Yet, there are differences between the conditions of shipbuilding engineers and those in other specialities, because there are different demands for them. There is little demand right now for the "classical" shipbuilding engineer at shipyards. On the other hand, there is an increasing demand, for example, for electronics engineers. The field of attractive jobs for shipbuilders is narrowing.

[Answer] (M. Banacki) I believe that enterprises of the shipbuilding industry, whether shipyards or design and development bureaus, pay the engineers more or less equally. During the probation period it is not 9000, but with bonuses and additional payments about 16,000 to 17,000. After probation it is between 19,000 and 20,000, and after eight years of service between 29,000 and 30,000. This is more or less even everywhere, so I wouldn't be afraid of mutual overbidding. Another matter is the level of pay. I disagree with the view that "it ought to be twice as high as workers' wages." This is not the point at issue. The fact is that we have no gauge to measure the value of an engineer's work. If an engineer is given a service assignment to resolve a technical problem, for example, he will not be able to receive a special payment for the invention, because for performing his assignment he is already receiving his salary with a bonus (for the inventor's rights). And yet he should be able to receive profits from his invention. When a worker doubles his productivity, he earns twice a much. If the invention of an engineer increases the profits of an enterprise, it should likewise increase his earnings.

I disagree with the view that there is no need for innovation. It exists both at the Shipbuilding Technology Center and at shipyards, but there is a shortage of people who want to do it. It takes both skills and desire. But I think that schools do not train their students to wish to come up with new ideas. On the other hand, the fact that engineers who leave shipyards and then successfully resolve technical problems in cooperatives or cement factories in the south is evidence that they do have the proper skills.

At the Shipbuilding Technology Center this year we hired one engineer, last year two. In the department I manage, we have eight vacancies. The Shipbuilding Technology Center must hire 8-10 shipbuilding engineers annually. This is necessary to ensure technological progress. It is also necessary, as I have said, to develop a system of measures to evaluate an engineer's work.

[Question] Do such systems exist in countries which treat engineers well? Isn't it an utopian idea, as impractical as an artificial system of prices? Shouldn't these decisions be made by the market as well? After all, all those cooperatives that were blamed pay engineers well not because they like them but because of the valuable work they do for the cooperative.

[Answer] (M. Banacki) Such gauges exist because products sell for a certain price ...

[Question] Exactly. So we are talking about the market.

[Answer] (M. Banacki) In the meantime, they say in Poland that for equipment made, for example, in a forge, nobody would remember the engineer who made the design.

[Answer] (K. Banecki) A large number of specialists contribute to the design of a ship, and the number of specialties is increasing along with technological progress. How do you imagine in this situation creating exact measurements?

[Answer] (M. Banacki) Both the managers of the shipyards and the workers' councils ought to be able to say that we have sold a ship for a particular amount thanks to the fact that it was modernized and this is to the credit of such and such individuals.

[Answer] (L. Bednarski) The prices of ships on the world market are known, and one can find out what proportion of this price is the cost of documentation. Then this portion can be compared with the prices of ships sold by our shipyards and thus effectively find out by how much our designers are underpaid.

I have formulated my own "Bednarski's Law," which reads like this: You cannot deceive nature; namely, if you pay an engineer too much, then for performing a particular job you will have to hire two or three instead of one. You will pay more, but the result will not be better. We are still unable to pay a good engineer well. And this concerns not only paying for inventions but for

managing the production process, for training workers, for promoting work ethics, for expanding one's own knowledge, for keeping abreast of world technology, because this too can be profitable when, for example, a modern production line purchased abroad will be put into operation earlier and more smoothly thanks to that knowledge. Professor Doerffer says that in addition to the eight hours of work at an enterprise a good engineer ought to work another six to improve his knowledge. This is the reason why an engineer should be paid twice as much as worker, and sometimes even three or four times as much, as is done in France. In the meantime, we are discouraging the engineer from raising his level of knowledge, from reading in two or three languages. Who reads foreign literature? This, too, is a way of damaging the engineer's professional profile.

[Answer] (M. Banacki) As a manager, I could pay an engineer five or six times more. I believe the situation is similar in other design bureaus. I don't know, however, whether I would be able to defend this decision to other employees. I have also the authority to pay bonuses, but I do not use it.

[Answer] (L. Bednarski) And do you know why you are not using it? Because it's not worth it for you to risk the trouble of interference on the part of those who would feel that they are being treated unfairly. You, yourself, are paid too little to risk the conflict, to convince and to act with resolve. All managers in Poland, even if they have broader authority, do not take advantage of it for the same reason.

[Answer] (W. Zylicz) We have been talking about the career of and personal prospects for a young engineer. At shipyards and at design and development bureaus, career chances don't look good. For example, the group of specializations at bureaus is growing narrower, and changing them becomes increasingly more difficult. One can work till retirement in the same room doing the same thing. This certainly cannot be fulfilling. The dissatisfaction grows over time, and there is a desire to leave and to find something new. On the other hand, in time very narrow specialists are formed, which become irreplaceable. When such a person leaves it's a tragedy. In our bureau, for example, the specialist who used to calculate the reinforcement for containers has left. For two years we were unable to find a replacement for him, because all the others are also specialists but in other areas. As a result, teamwork was disrupted, but today design and development projects are a teamwork enterprise. Some bureaus can no longer operate, and not because they have lost 100 or 200 people, but just a few specialists left and all fell apart. As a result, we have to wait for certain drawings or calculations for months while the entire project could have been completed within that time.

I have tried to understand why people leave. Very often, the tragedy is the fact that those who leave are very good workers with 10 years of service who are experienced and have good prospects for the future. At the same time the veterans of the industry, its founders, are retiring--and these are people with invaluable experience. The generation gap is widening. (At the design and development bureau of Szczecin Shipyards this will happen a couple of years from now, because the bureau was opened 10 years later than ours.) At the

design and development bureaus of shipyards, three-quarters of general project managers who designed ships over the past 40 years have already left! The majority of those who still remain will follow them in the next few years, and we do not see who will replace them. One can easily imagine the results.

Generally, it seems to me that our industry, shipbuilding, is not the motive force of technological progress, and it never has been, because at best it followed the lead of world accomplishments. Those who pushed for progress were shipowners. Demanding shipowners insisted on design and construction of modern ships. Currently, during the period of crisis the good shipowners, even when they build do so in their own countries. As a result, for a couple of years--at least at Gdansk Shipyards--there have been practically no new modern ship designs.

To come back to the problem of young people. They come to a design bureau and get stuck in a specialization rut. With time, they begin to feel the lack of money more and more acutely and cannot earn any more in this industry. They begin to take up freelance jobs in the evenings. I do it myself to support my family--three to four hours a day, sometimes more. These odd jobs often have nothing in common with the work at the design bureau, which certainly suffers from that, because fatigue has its consequences. At a certain point, one naturally comes to the conclusion that this has to be changed, that the work at the bureau does not yield the desired results. An extreme decision, although again not all that rare, is the intention to emigrate abroad. I think that among the people who graduated from the Institute of Shipbuilding of Gdansk Polytechnic in the class of 1976, about 20 percent are abroad. Generally, the most valuable people left, because these were enterprising and vigorous people who spoke foreign languages. These are great losses for the nation. Many of them, as I know, have been successful in their profession despite the crisis. We were unable to keep them. At our bureau, for example, an excellent shipbuilding computer programming has left. This was a person who lived by his work, who left the office late at night and at that time couldn't even buy bread. At a certain point, he came to the conclusion that that made no sense. Now he is a highly valued specialist in Canada, and we have not found a replacement for him for two years.

At Gdansk Shipyards a study of the financial situation of engineers was conducted recently. It turned out that in 1985 a young engineer at a design bureau immediately after his probation period earned half the wages of a worker hired right from a vocational school. The former was 23-24 years old and had gone through years of intensive study and substantial spending by his family, while the latter was 17 years old, had a diploma from a vocational school obtained by an incomparably smaller effort. Some engineers earned $1\frac{1}{2}$ times as much as their colleagues in the bureau simply because they were hired in the position of a foreman, which should not at all be the purpose of an engineer's work. There are also disproportions inside the enterprises: The engineers at the design bureau on average earn less than engineers and technicians working in production.

[Answer] (M. Kotlewski) Why is shipbuilding unpopular among high school graduates? First of all, these are difficult and extremely laborious studies. Secondly, the diploma of an engineer--for example, in the building of ship bodies--limits the possibility of choice of career and job. Thirdly, work at a shipyard is extremely difficult and unsafe, involves a high degree of responsibility and is not paid better than anywhere else. If we add to this the crisis in our shipbuilding industry, we should not be surprised that young people do not want to make it their career choice for life.

Talking about the factors tying a worker to an enterprise, I would place salary at the top. I don't know that there is another such country in the world with such disproportions between the pay of an engineer and a worker! We are now paying an engineer some 80 percent of what a worker makes. Yet, around us are firms offering him a much higher salary. I only wonder who promotes this? On the other hand, we cannot pay properly in the industry, while, on the other, the government by allowing graduates to be employed outside the industry confuses these people and creates a wrong atmosphere in the industry. We cannot blame young people themselves.

It is not by accident that I mention the government. It is an error on the part of the government that they allow graduates to be employed in other industries, that they allow the creation of all kinds of cooperatives, shops selling produce, etc., and also the possibility of traveling abroad to make money.

The second factor is interpersonal relations--not housing. If a graduate is treated badly, no wonder that he would seek new employment.

Finally, the problem of housing. If a graduate has to wait 20 or 25 years to get an apartment, one should not be surprised that an engineer goes to work on a farm or decides to grow cherry trees instead of working at a shipyard.

[Answer] (A. Sliwczynski) It seems to me that conditions attractive to people should be created in the industry rather than issuing orders and prohibitions!

[Answer] (J. Burzynski) Mr. Kotlewski has reproached me rather aggressively for the failure on the part of the school to promote and propagandize shipbuilding courses among young people. Six or eight years ago we did such promotions. Members of the faculty went to high schools, talked to students and praised this career. The results were negligible. And this was before the crisis in our shipbuilding industry!

Now I want also to pick a bone with the Association of Enterprises of the Shipbuilding Industry [ZPPO]. Last year I asked ZPPO to arrange for a conference and undertake some consulting efforts. I never received a response. I will not conceal the fact that, eventually, I had taken steps through the medium of the Provincial Committee of the PZPR. I hope that under its aegis such a conference after all will take place.

Certainly, the crisis in student enrollment is connected with the crisis in the shipbuilding industry--in Poland and worldwide--and with the crisis in engineering careers in general. All the speakers here emphasized the low pay. This is certainly justified, but I believe that it is not a matter of paying them more but primarily of differentiating them--strongly differentiating them! I am really surprised that those who can use this differentiation are not doing so.

It is true that our shipbuilding industry is not innovative. We have too much faith in the specifics of shipbuilding. In fact, we are not employing any too-specific technologies. We are not even trying to enforce high quality in other industries, or maybe just a little ...

[Answer] (W. Zylicz) This "little" comes from shipowners and licensing authorities and not from the shipbuilding industry.

[Answer] (J. Burzynski) Fifteen years ago, at a conference of the then association of the shipbuilding industry, Professor Doerffer and Professor Kobylinski suggested that we launch a program of development of oceanfaring shipbuilding. This proposal met with no response, because it was said that "we have a lot of orders for many years." The Szczecin center was the only one to look ahead. Actually, our institute is working closely with the Szczecin Shipyards, from where we receive orders and contracts. But nothing comes to us from Gdansk and Gdynia shipyards: neither from the Gdansk Shipyards nor from the Paris Commune Shipyards nor from Polnocna Shipyards. Nothing.

Why doesn't this great industry promote innovation? They say that in a large office a person falls into a specialization rut and perishes. He is lost in the gigantic machine! But the time when it was believed that the bigger the better has passed. Now, small is beautiful and productive. Why is there no competition between our shipyards and design bureaus? But these are giant monopolies! It is no accident that even in the remarks of the representatives of ZPPO we heard the elements of the "command and prohibit" mentality. One can prohibit and make the drain of employees impossible, but a slave will never make a good worker. Never! Our shipbuilding industry will be in a bad state as long as people run away to small enterprises. There is a need for more initiative and new solutions--organizational, technological and engineering!

We will create new directions and specializations at the institute. Primarily this concerns oceanfaring shipbuilding with several specializations. But also specialists in the area of ship equipment and facilities.

[Answer] (J. Kula) As a student on the verge of graduation, I am happy that the editorial board decided to raise this issue of daily concern to students. I am glad that there is an awareness of the matters of employment, housing and wages that are so troublesome to us. I must say that for us these practical questions of where to live and how to support oneself completely overshadow the matter of future career satisfaction. When deciding whether to take a job with the Shipbuilding Technology Center or the shipyard, we think only as to where to live and how to make a livelihood.

Actually, I am one of those who decided to go into shipbuilding because of romanticism. I come from Wegorzew in the Mazury area. I have loved sailing from the time I was young, and in my studies I preferred the construction of ship bodies to machines; teachers at the college helped to develop my interest. And yet, gentlemen, I could go back to Wegorzew, where I have a farm which brings me annually 3 million zlotys! And what can I make at the shipyards?! Even if it is 50,000 monthly! Nevertheless, my parents are insisting that I remain in Gdansk. They have spent a lot on my education over six years. Before that, they spent money for another six years of education for my big brother, who is now a doctor. No wonder that they bought their first car just last year. Were it not for our educations they could have gotten it 10 years before.

A student working with a students' cooperative cleaning ships in the repair shipyard earns 1000-1500 zlotys daily. Two such "cleaning" days give me as much as the monthly scholarship from the Paris Commune Shipyards that was mentioned earlier! And there is no need to make any commitments with the enterprise. Representatives of the industry have been complaining about competition from cooperatives. But these cooperatives most of the time work precisely for you and receive their "big money" from you. Why don't you pay your own people appropriately and not use the services of the cooperatives, which, after all, do not rob anybody to make this money?

I would like also to add that, nevertheless, better information about study and work in the shipbuilding industry is certainly needed.

[Answer] (J. Burzynski) We will try to do that. I am planning to issue a brochure, but at this point the school doesn't have money for this. We are expecting the industry to help us.

[Answer] (W. Zylicz) We could finish our sad discussions with a note of optimism. Certainly, our shipbuilding industry is not threatened by a crisis similar to that now experienced by world industry. There is no chance we will be short of contracts, so there is no danger that shipyards will be closed. One can hope that if the shortage of engineers is noticed and becomes acute, then, perhaps, they too will come up in price.

[Question] The problem, however, is that correcting damage done in this area will take years, and one will have to wait a long time until any results are obtained. This is why we should sound the alarm even today to ensure that there are people to design and build up-to-date ships that will be easy to sell 10 or 20 years from now. Thank you, gentlemen, for your remarks. In conclusion, one feels that is important for everybody to become aware that the time is over when there was a surplus of engineers so that employers could afford to underpay them!

9922
CSO: 2602/25

BRAZILIAN PROTECTIONISTS IN COMPUTER INDUSTRY TO ORGANIZE

Rio de Janeiro DATA NEWS in Portuguese 9 Feb 87 p 6

[Article by Mari-Angela Heredia: "The Computer Industry Lobbies the Framers of the Constitution"; first paragraph is boxed material]

[Text] Together with computer companies and associations, the Special Secretariat for the Computer Industry and the Ministry of Science and Technology have begun a strategy of "scouting out the lay of the land" with the framers of the Constitution in order to mobilize the freshmen and improve their standing with some of their hard-line opponents.

The Special Secretariat for the Computer Industry (SEI) and the Ministry of Science and Technology have made a move to join forces with computer associations such as ABICOMP and MBI and companies like Cobra and Serpro to undertake a joint lobbying effort with the framers of the Constitution. Last Friday, Cmdr Jose Ezil Veiga da Rocha, executive secretary of SEI, began planning the effort to be made with the Congress.

At the office of Sen Severo Gomes (PMDB-SP), an old-line defender of the Market Reserve Act, the plan of action got under way in the form of conversations with congressmen who have already made a name for themselves in this area, such as Cristina Tavares of Pernambuco. The government agencies will begin with these persons, who are already well-known in the computer industry, and then proceed to mobilize freshmen and improve their standing with some of their hard-line opponents, led once again in this legislature by Sen Roberto Campos (PMDB-MT).

One of SEI's ideas is to recruit businessman from the computer industry to lobby the framers of the Constitution. If this initiative pans out, businessmen representing regional associations and ABICOMP itself may be seen lobbying the leaders of every party every week in the National Congress.

The Vote

In addition, and even amidst the confusion of the opening of the National Constitutional Assembly, officials from SEI, the Ministry and other government offices got started. In the Senate coffee shop, they timidly approached new congressmen in an effort to "scout out the vote." SEI is already aware,

for example, that Nelson Wedekin, a new senator (PMDB-SC), may become an ally. Since informal conversations have shown that he is not against the bill, the goal now is to get him to be a defender of the policy within his faction.

However, the larger goal is to bring together SEI specialists and advisers, computer businessmen and representatives of the Brazilian Computer movement among congressmen. An advisory group will even be set up to further this goal. Deputies and senators will be able to take their questions about the bill and the policy itself directly to members of the computer community, who will be circulating in the Congress for that purpose. Depending on the nature of the question, congressmen will get an immediate written or verbal answer in the form of a visit with a SEI specialist, who will clarify the matter.

According to Minister Renato Archer, a white paper is even being written. It will include all position statements for and against the policy since the bill was written and even before. The Special Secretariat for the Computer Industry and the other computer-related federal agencies are aware that the job will not be easy. They have not started out in haste. Even though the congressmen have been oriented toward more urgent issues at the early stages of the Constitutional Assembly since their arrival in Brasilia (such as the guidelines, the powers of the two chambers, etc.), old hands, at any rate, noted some friends of the computer industry getting their lobbying effort under way.

Not a direct offensive, because that was not proper. But their presence was important and so long as all the congressmen's positions are not fully known, the goal is slowly to assemble a list of allies. To date, the list includes such well-known names as Deputies Cristina Tavares (PT-PE) and Bete Mendes (PMDB-SP); Senators Severo Gomes, Fernando Henrique Cardoso and Mário Covas (all PMDB-SP); Carlos Chiarelli (PFL-RS), Virgílio Távora (PDS-CE); Joao Calmon (PMDB-RJ); Nelson Carneiro (PMDB-RJ) and Marcondes Gadelha (PFL-PB). The list of deputies started by SEI also includes the former health minister, Carlos Sant'Anna (PMDB-BA); Jorge Arbage (PDS-PA); Cid Carvalho (PMDB-MA); Domingos Leonelli (PMDB-BA); Prisco Vianna (PMDB-BA), Alvaro Valle (PL-Rj); Pimenta da Veiga (PMDB-MG); Chico Amaral (PMDB-SP); Irma Passoni (PT-SP); José Genoíno (PT-SP); Ralph Biasi (PMDB-SP); Sigmaringa Seixas (PMBD-DF); Jofran Frejat (PFL-DF); Augusto Carvalho (PCB-DF); and Amaury Muller (PDF-RS).

SEI is aware that this is only a preliminary list and assumes that more names will be added as time goes on. Even though the list is the result of a certain amount of guesswork about congressmen contacted so far or those known to be allies, it does include a name that SEI considers very important: Deputy Sarney, Jr. (PFL-MA), who, although he has not taken a position on the issue of the computer industry, is a name that carries a lot of weight.

8844
CSO: 3699/60

BRAZILIAN RETAILERS OF FOREIGN SOFTWARE CRITICIZED

Rio de Janeiro DATA NEWS in Portuguese 23 Mar 87 pp 18-21

[Article by Rosane Serro: "Alternatives Taken by National Retailers"; the first paragraph is boxed material at upper left]

[Text] By circumventing the Special Secretariat for Computers (SEI) and the National Industrial Property Institute (INPI), Brazilian software retailers are increasingly entering into direct agreements with international suppliers, taking advantage of bureaucratic and tax loopholes to pay royalties and import masters duty free for copying purposes.

Tax loopholes. Anyone who thinks that tax loopholes are only used to pirate computer programs is mistaken. Such methods are also involved in marketing foreign software in Brazil, which, lacking proper legislation regulating the trade, is turning the market for computer programs into a no man's land.

The retailers' argument justifying the use of their methods is the excessive paperwork required by SEI to approve marketing contracts and legitimize the payment of royalties, which discourages any thought of properly legalizing agreements. The result is unofficial traffic in software masters to be copied, dollars remitted abroad without authorization, and contracts based on the Copyright Act, which SEI does not recognize as being applicable to transactions of this nature.

In the opinion of Brazilian attorneys and software companies, this situation may improve (but not be fully resolved) by a software bill to be voted on by the National Congress. However, until the bill becomes law, these unofficial methods used by foreign software retailers will be prohibited directly by Federal Revenue, which, once the hardware control program was undertaken, organized for an identical operation (see box).

[Next three paragraphs are boxed material, p 18]

A Case for the Federal Police

Loopholes used by some software companies will only be closed by Federal Police intervention. This is the opinion of Francisco Ramalho, the new president of the Brazilian Association of Computer Service Companies (Assespro),

who plans to sign "some kind of agreement" shortly with the Federal Police to prohibit such circumventions.

According to Ramalho, the trade is fraught with gray areas which complicate effective regulation of the trade. "Software is a highly intangible commodity," he said, intimating that a specialized corps of select agents would be organized to implement the program. "A handful of policemen would be enough to have a positive effect," he continued.

According to Ramalho, merchandise is entering the country unofficially, hard currency is being remitted abroad under irregular procedures, and contracts are being signed that are based on a law that is not considered applicable by the agency regulating the trade. The president of Assespro asserted that "This is contraband technology and it can only be dealt with by the police."

SEI has determined that in order for foreign software to enter Brazil and be legally paid for, a contract with the foreign supplier must be approved by INPI under technology transfer provisions. Under SEI Regulation No. 13 (INPI Regulation No. 53) of February, 1981, contracts are to be approved by the SEI/INPI Joint Commission, which must examine all the provisions stipulated in contracts. Upon approval, importers will be allowed to pay royalties in the amount of five percent of software sales invoiced in Brazil.

If retailers are interested in providing software directly or indirectly to agencies of the federal government, the software must be registered with SEI under Category B per SEI Regulation No. 22 of 1982, covering "Computer software developed abroad, with no Brazilian equivalent, whose programming technology, marketing rights in Brazil, and obligations to provide auxiliary services have been transferred to Brazilian companies capable of providing said services and developing new programs or services in Brazil with their own personnel." Only after complying with these requirements may retailers import software into Brazil.

In Practice

However, this is not what happens in practice. Many companies decide to simplify their work and thus get ahead. Entering into a direct agreement with a foreign supplier and circumventing SEI and INPI is the most common way, but it involves a series of tax and regulatory circumventions.

How software is brought in, for example. According to sources within the trade, there are three basic ways to import software into Brazil free:

Suitcase Method. Bring in the software master in a suitcase on a trip and declare it for personal use.

By Courier. The foreign supplier sends the software to the retailer by an international courier service like Petit Paquet or Colis Posteaux as if it were a book. Declaring a value of $20 (the minimum), the package is not opened by federal inspectors.

By Modem. The supplier may telecommunicate all the data in a program with no problem at all.

Payment

The payment of royalties for software marketing rights is a little more complex. The company has to "launder" the purchase of dollars to be remitted abroad by coming up with some sort of expense to justify an expenditure. In this case, the issuance of unpaid tax notes would imply delinquency. If the retailer insists on going around INPI to effect payments owed to suppliers, he may choose one of the following methods:

Carrier Pigeon. This involves hiring a person to take dollars abroad personally. Often, the "carrier pigeon" is the same person who brings the software in.

"Legal" Royalties. The retailer pays royalties in the normal way as if owed for the publication rights to technical documentation provided by the supplier. To legitimize the transaction, the retailer uses DECAM Notice No. 325 of the Banco Central, which allows the payment of royalties, without prior approval, for "books to be published or records to be pressed or marketed in Brazil."

Deposit in a Current Account in Brazil. In this method, the deposit is made in cruzados and the foreign supplier acquires the option of investing in Brazil, including the purchase of real property.

Deposit in a Current Account Abroad. The retailer purchases a check from a foreign account holder and issues a payment order in dollars that is payable to the supplier.

Even though they are not recorded officially, the methods used by some retailers are general knowledge in the trade. Rafael Barajas, manager of Compucenter (one of four Brazilian companies holding marketing rights to the hottest software for microcomputers in the international market), who is also president of the Brazilian Association of Software Companies (ABES), says that these procedures are "an obvious example of civil disobedience, since no one even considers applying to SEI for import permits.

In Barajas' opinion, going through the legal process required for a marketing contract is frustrating, since SEI doesn't approve any." He went on to say that "At the end of Public Law No. 7232, it is provided that any case concerning software will be governed by a special law. Since software is not regulated by law, nothing that is being done is valid, and there is no legal basis for payment," he argues.

Compucenter itself, according to its manager, applied to SEI and INPI for registration of various products, but gave up after 18 months of trying when it received a letter from SEI requesting more technical details so that the contracts could be studied further.

"At that point, we started dealing directly with the foreign supplier under the Copyright Act. This is what makes it possible to pay royalties. I don't know how Brazilian authorities like it, but we have been getting along like this for a long time with no problems."

Two other ways of dealing with foreign suppliers have also been used, which, even though they get around scrutiny by SEI or INPI, do not involve unofficial payment in dollars. These methods were discovered by Brasoft and Intercorp, which shares imported software with Compucenter and Datalógica. Brasoft was able to sign an agreement with Microgro, the WordStar supplier, which provides that royalties will be delayed until Brazil legally defines software.

"Microgro originally released us from the obligation to pay royalties on marketing rights to the Star line for 3 years. In exchange, we are obliged to translate the manuals, provide all technical product support and even defend the Star image (which has been eroded by pirating) in promotional campaigns," explained Ivan Ribeiro, Brasoft's manager.

Intercorp signed contracts with its suppliers on similar terms by placing royalty payments on deposit and making investments in Brazil pending passage of the software bill. According to Ricardo Nick, Intercorp's manager, payment was negotiated under the international guidelines of 5 to 15 percent of the value of each copy sold. "We tried to register our products with INPI, but it was such a difficult process that we opted to go the other route," he said.

Opinion

Datalógica decided to invoke copyright protection and effect royalty payments for software provided by Ashton-Tate, a North American company, under copyright legislation. According to Octávio Slemmer, Datalógica's manager, SEI's ruling that all marketing contracts must be approved by INPI is "an opinion subject to interpretation," and the argument that any other way is illegal "is a confusing ploy which leftwingers are promoting."

In Slemmer's opinion, the copyright act covers "anything that can be understood to have been authored," even though it does not expressly provide protection for software (a number of countries are amending it to cover software). As far as royalty payments are concerned, Datalógica's manager sees a contradiction:

"SEI ruled that approval can only be given by INPI, but the banks approve payment under copyrights covering technical documentation and allow the exchange. Federal Revenue even taxes these dollars when they are remitted abroad as royalty payments. But this is a pointless discussion, a boring conversation."

SEI: It is Illegal

In the face of the claim advanced by retailers of imported software that the copyright law legitimizes the payment of royalties without the need for ap-

proval by any agency within the Ministry of Industry and Trade, SEI claims that this method is illegal because the central item for which payment is effected is the software, not the manuals and documentation which retailers claim to publish.

According to Toshiaki Sasaki, head of the Software and Service Department at the Special Secretariat for Computers (SEI), remuneration for software (between non-affiliated companies) can only be authorized by INPI. "Any other way of effecting payment is irregular," he says. According to this department head, not even Brazilian subsidiaries of multinational companies may remit dollars abroad to buy software, since a subsidiary cannot pay a parent company for technology transfer.

Figures Lacking

Sasaki realizes that the various circumventions are difficult to control and that there are not even any statistics on the subject. None of the figures given by the agencies or the companies in the trade match very well in any area. For example, ABES, which encompasses the majority of the retailers of foreign software, says that the software market was $500 million in 1986, 80 percent of which was generated by the sale of foreign software and 40 percent by software for microcomputers.

SEI, for its part, has no market figures, but has registered 9,000 programs. Of these, Sasaki believes that 60-70 are classified in Category B, i.e., for sale to government-owned companies. INPI, which is currently responsible for authorizing payment of royalties for marketing software, does not have the least idea how many programs it has registered for permission to effect dollar payments.

Inspection

Bráulio Café, Federal Revenue officer in Rio do Janeiro, confirms confusion in the matter and says that it is impossible to control incoming software being imported into Brazil informally, or as Federal Revenue phrases it, to inspect software in the "first zone," i.e., at Customs or at the post office. According to Café, control is only possible in the "second zone": at the companies that market foreign software. This is where software import permits should be applied for, and failure to produce permits would be grounds for seizing the merchandise.

Beyond this, Federal Revenue examines the companies' tax records, checking the books to see whether tax returns actually reflect services performed by the companies. This is the kind of effort which Federal Revenue will step up over the next few months when the National Contraband Reduction Program, thus far implemented only by seizing and taxing hardware, will turn its attention to the software market.

"We have no interest in putting the companies out of business. We have even given them a grace period in which to adjust. But we must in fact protect the Brazilian computer industry by cutting off the illegal entry of hardware and software into the country," Officer Café added.

However, rigorous control may not be beneficial for the economic administration of the country. This is the opinion of Attys Manuel Pereira dos Santos, Regina Torres and Sílvia Gandelman, who, after having studied all the variables, concluded that the government is fully aware of the problem, but that it is not stopping it so as not to worsen the country's balance of payments by including dollars remitted abroad, which would only aggravate our foreign deficit.

[Next five paragraphs boxed material, p 20]

"Only a businessman with opportunistic ambitions claims that there are insurmountable obstacles to importing software legally." This is the opinion of Christopher Paterson, president of Systems, Planning and Analysis (SPA), who had been dealing with SEI and INPI for 18 months and adapting his product to the marketplace for 10 months before that to get Open Access on the Brazilian market.

In Paterson's opinion, it is quite possible to follow the SEI ruling and comply with the requirements imposed in the case of a foreign supplier by signing a "fully satisfactory" contract. "Five percent of sales, the figure authorized by INPI for royalty payments, can be a very attractive amount to a supplier if the prices obtained by the retailer are marked up so as to have the effect of a higher rate," he explained.

The president of SPA said that before contacting SPI about marketing Open Access in Brazil, he consulted INPI to ascertain whether the terms in the contract to be signed would meet the agency's requirements. According to Paterson, INPI then imposed further requirements. He negotiated again with the supplier and then spoke with INPI once more. This time, the contract was examined by the SEI/INPI Joint Commission and immediately forwarded to INPI for approval as a technology transfer contract.

Not satisfied, Paterson tried to register the software with SEI in order to sell it to government-owned companies. There was another waiting period, because this time SEI imposed additional requirements to be certain that the case was an instance of technology transfer. The result: it took Open Access 28 months to get on the Brazilian market. "We only initiated sales after all this had been done," said Paterson. And the terms of the contract were met because SPA used Open Access technology to write an iterative language compiler program. In other words, the technology transfer requirement imposed by SEI actually took place.

If a company wishes to go through the same procedure in dealing with a foreign supplier, the president of SPA has some words of advice for keeping one's patience with bureaucratic delays: "Remember that, depending on the company's size, its contribution may be invaluable, because with the advent of the market reserve, the supplier may carve out a share of the market that would have been unthinkable before. Also, it is good strategy to enter into agreements with small and medium-sized companies interested in adapting and contributing to the spread of technology in countries like Brazil."

Sílvia Gandelman argues that "Everyone knows that the authorities are aware of the problem and they are correct in not controlling the situation: they are acquiring cheap technology without aggravating our balance of payments."

Manoel Pereira dos Santos pointed out that "If all the dollars that have been remitted abroad illegally to pay for foreign software were actually added up, the picture would be black. Our situation with the deficit would be far more serious."

In the opinion of these attorneys, the only way to reduce the impact of these paperwork circumventions for importing software is to institute new procedures for legitimizing the process. Thus the bill to be voted on by the National Congress would partly meet this need by requiring licensing or lease contracts (in addition to the approval of technology transfer contracts) in order to make possible other mechanisms for effecting payments than those currently required by INPI. According to Atty Gandleman, the new terms for legalizing the process only address the issue of paying for copies sold, not technology.

New Obstacle

However, the same bill that sets up new payment mechanisms also entails new obtacles to the uncontrolled sale of foreign software. This is the SEI requirement that registration will only be approved if it can be shown that the software in question is not "functionally equivalent" to other software written in Brazil. Atty Regina Torres said that "The marketing philosophy seems fine to me, but the mechanisms to implement it are still indefinite."

In her opinion, the requirements of functional equivalency, similarity to Brazilian software and registration stipulated in the bill are not made explicit, and if left up to the bureaucracy, they could further aggravate regulation of the Brazilian software market. However, her argument is challenged by SEI, which believes that details of criteria can be worked out later. Toshiaki Sasaki, head of SEI's Software and Service Department, said that "Once the bill is passed, regulations can be written: the purpose of the Software Act is to provide guidelines."

Functional equivalency and similarity to Brazilian software are still resisted by retailers of imported software, who believe that these two requirements alone will invalidate the procedure. In acknowledging these reactions, the SEI department head argued, "The lack of a legal procedure encourages the proliferation of all these circumventions. Why are they resisting an attempt to legalize the situation?"

8844
CSO: 3699/60

END

36

Foreign Broadcast Information Service (FBIS) and Joint Publications Research Service (JPRS) publications contain political, economic, military, and sociological news, commentary, and other information, as well as scientific and technical data and reports. All information has been obtained from foreign radio and television broadcasts, news agency transmissions, newspapers, books, and periodicals. Items generally are processed from the first or best available source; it should not be inferred that they have been disseminated only in the medium, in the language, or to the area indicated. Items from foreign language sources are translated. Those from English-language sources are transcribed, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [ ] are supplied by FBIS/JPRS. Processing indicators such as [Text] or [Excerpts] in the first line of each item indicate how the information was processed from the original. Unfamiliar names which are rendered phonetically or transliterated by FBIS/JPRS are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear from the original source but have been supplied as appropriate to the context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by the source.

SUBSCRIPTION/PROCUREMENT INFORMATION

The FBIS DAILY REPORT contains current news and information and is published Monday through Friday in 8 volumes: China, East Europe, Soviet Union, East Asia, Near East & South Asia, Africa (Sub-Sahara), Latin America, and West Europe. Supplements to the DAILY REPORTs may also be available periodically and will be distributed to regular DAILY REPORT subscribers. JPRS publications generally contain less time-sensitive information and are published periodically. Current JPRS publications are listed in *Government Reports Announcements* issued semi-monthly by the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161 and the *Monthly Catalog of U.S. Government Publications* issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

U.S. Government offices may obtain subscriptions to the DAILY REPORTs or JPRS publications (hardcovers or microfiche) at no charge through their sponsoring organizations. DOD consumers are required to submit requests through appropriate command validation channels to DIA, RTS-2C, Washington, D.C. 20301. (Telephone: (202) 373-3771, Autovon: 243-3771.) For additional information or assistance, call FBIS, (703) 527-2368, or write to P.O. Box 2604, Washington, D.C. 20013.

The public may subscribe to either hardcover or microfiche versions of the DAILY REPORTs and JPRS publications through NTIS at the above address or by calling (703) 487-4630. Subscription rates will be provided by NTIS upon request. Subscriptions are available outside the United States from NTIS or appointed foreign dealers. Back issues or single copies of the DAILY REPORTs and JPRS publications are not available. New subscribers should expect a 30-day delay in receipt of the first issue.

Both the DAILY REPORTs and the JPRS publications are on file for public reference at the Library of Congress and at many Federal Depository Libraries. Reference copies may also be seen at many public and university libraries throughout the United States.